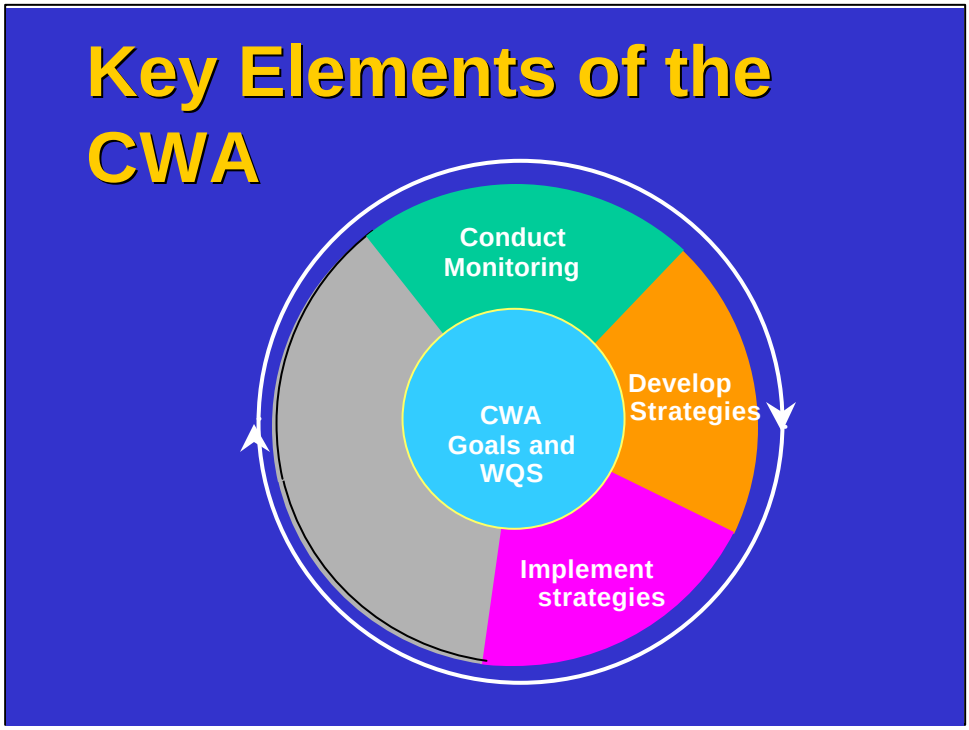
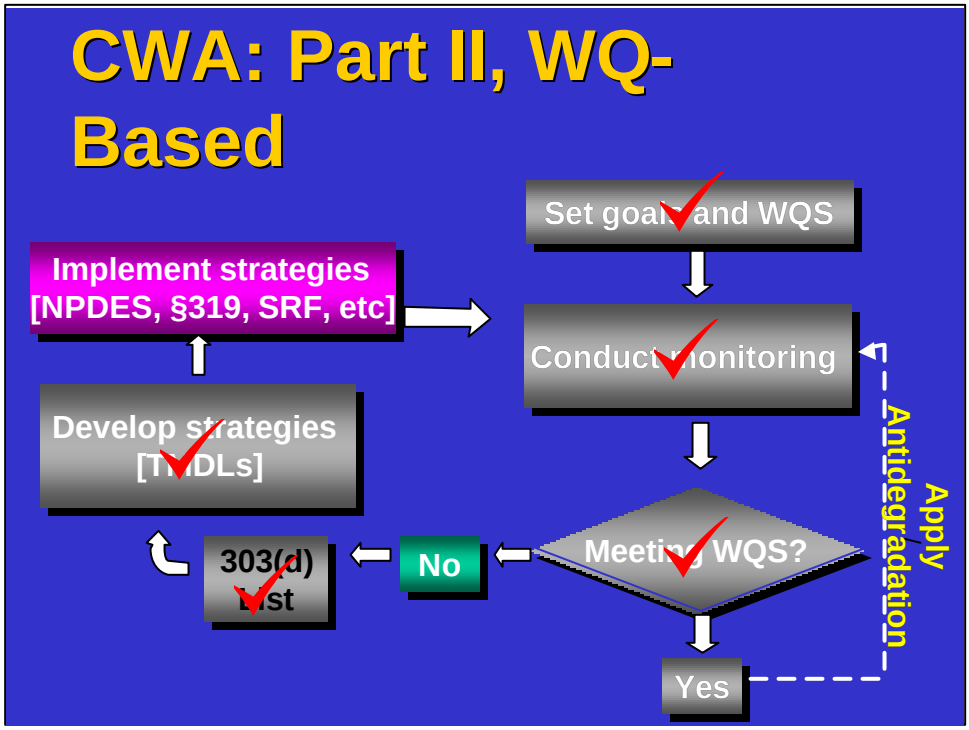
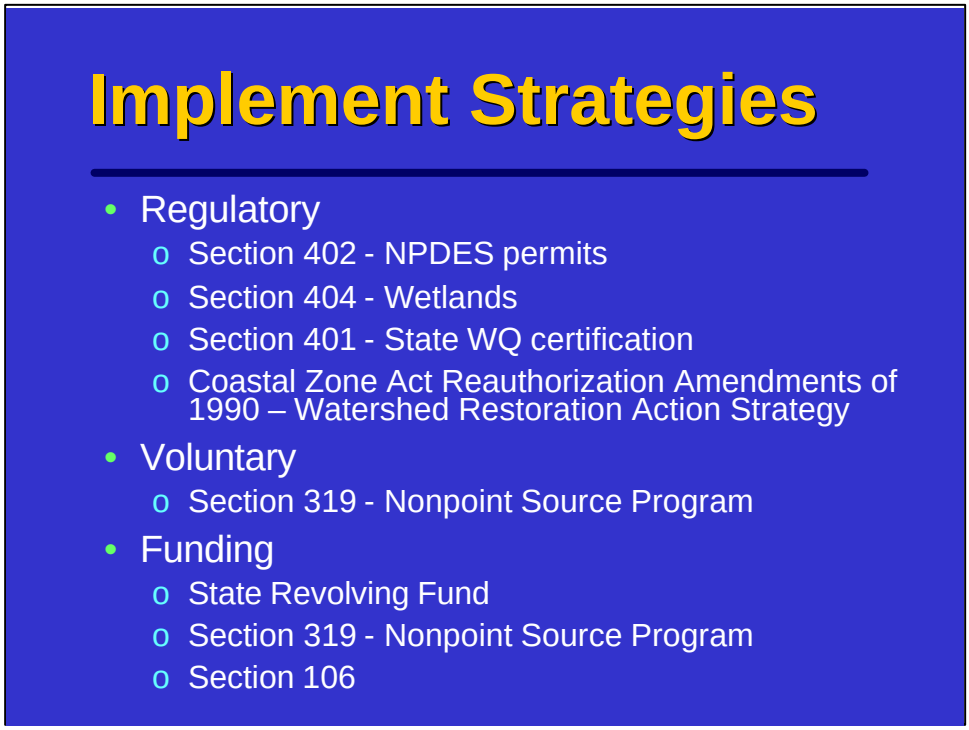

Implement Strategies to Meet Standards
CWA Point Source Programs
Section 404 Program
SDWA Infrastructure Integrity
The Watershed Academy



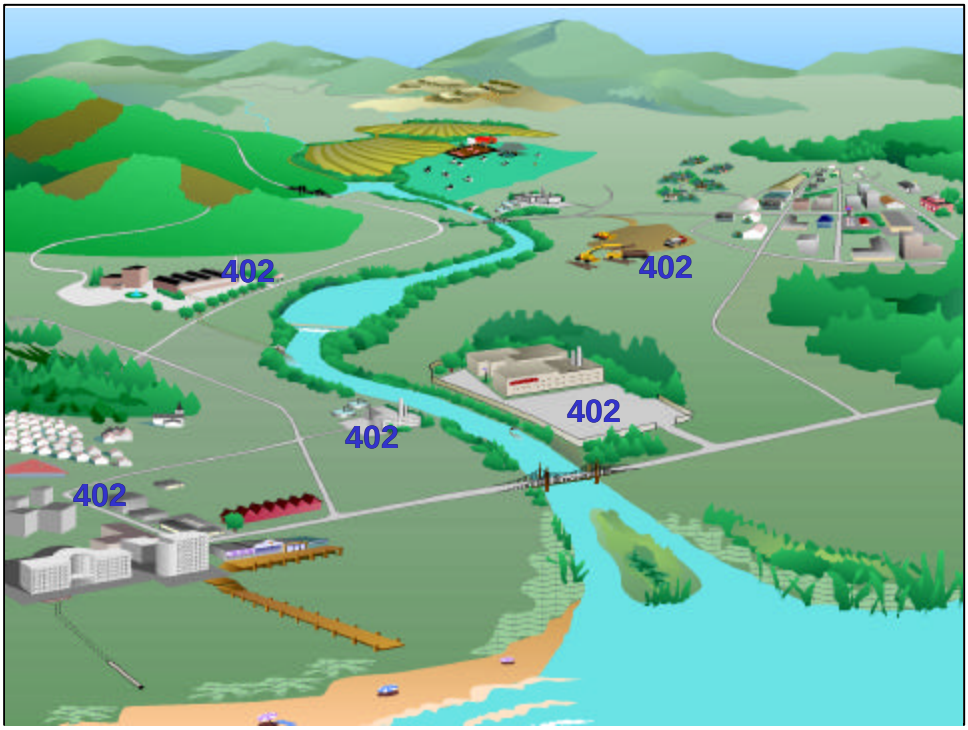
- This section addresses implementing strategies to carry out the CWA goals and ensuring the integrity of drinking water infrastructure to ensure the delivery of safe drinking water.



- Just a reminder that we are moving into another phase of the overall WQ-based CWA process. Now that we've determined an allowable total load, and distributed it among sources, the next step is to use various tools to bring about the needed loading reductions and meet WQS.

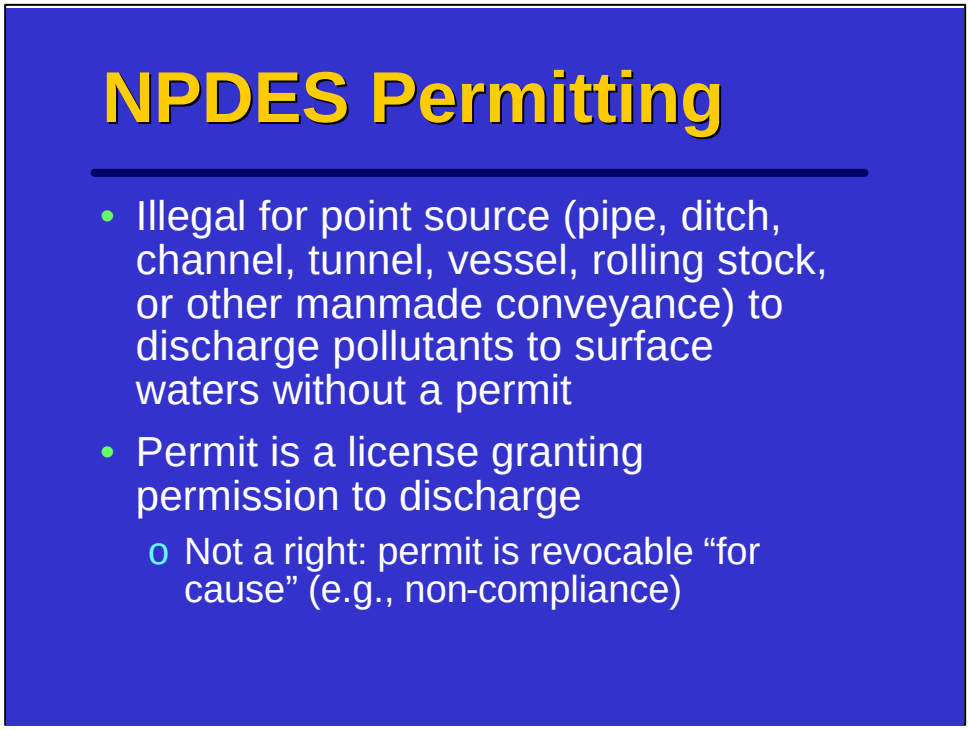


- Typically, it will be necessary to employ a variety of tools during the implementation phase. Which tools will depend on the type of sources present, as well as social, political, and economic factors.
- The three categories of tools listed here—regulatory, voluntary, and funding— are actually not separated by clear and distinct lines. In particular, funding available through the CWA can be applied to foster reductions needed under either voluntary or regulatory programs.
- Note that coastal nonpoint source pollution control programs are implemented through Watershed Restoration Action Strategies (WRASs) under section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (rather than the CWA). WRASs are two-year State and local government cooperative agreements to develop watershed protection and restoration strategies, authorized by section 319 of the CWA.



- The number 402 appears in and next to facilities and activities in our fictional watershed that would be covered by the National Pollutant Discharge Elimination System (NPDES) program. NPDES is a regulatory permitting program that deals with what the CWA and EPA regulations identify as point sources.

- This outfall is a pretty obvious example of a point source. Sometimes, it's not so easy to determine whether a particular discharge should be treated as a point source, according to the legal definition under the CWA.



- In most cases, NPDES applies only to direct discharges to surface waters. There have been some cases in which discharges to ground water that is "directly hydrologically connected" to surface water have been pulled in under NPDES.
  - This is similar to what is called "ground water under the influence of surface water" (GWUDI) under SDWA. In both cases, there is a close connection between surface and ground water. In the former case, the ground water influences surface water; in the latter; it is the reverse.
- Also note the wide variety of "conveyances" that are considered point sources, including boats and offshore oil rigs. Sometimes it can be hard to determine whether a ditch or gully is truly a "manmade conveyance." For example, should a gully that conveys storm water runoff into a stream be considered a point source? It's probably not a natural feature of the landscape, but rather is due to improper land management. On the other hand, it was not created intentionally by humans.

NPDES Program: Coverage

- Wastewater
- Storm water runoff
- Concentrated animal feeding operations
- Mines
- Ships
- Offshore oil rigs
- Remedial action activity

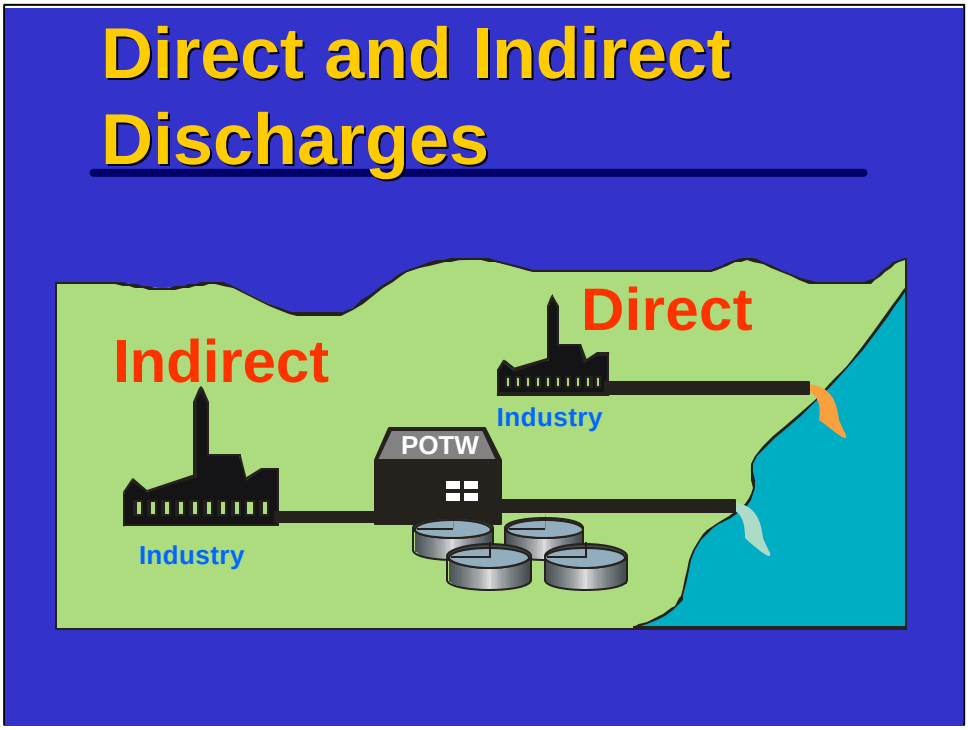
- The NPDES program covers:
  - Industrial and municipal wastewater;
  - Industrial, urban, and construction-related storm water runoff;
  - Concentrated animal feeding operations (CAFOs) of at least 1,000 animal units:
    - Beef cattle -- 1,000 slaughter and feeder cattle
    - Dairy cattle -- 700 mature cattle (milked or dry)
    - Swine -- 2,500 animals over 55 lbs.
    - Horses -- 500 horses
    - Sheep -- 10,000 sheep or lambs
    - Turkeys -- 55,000 turkeys
    - Chickens -- 100,000 hens or broilers (with continuous overflow watering);
  - Active and inactive mines, and abandoned mines on Federal lands;
  - Some ships and other vessels;
  - Offshore oil rigs; and
  - Discharges from RCRA remedial action activity meeting the point source definition.

Exemptions from NPDES for Certain Point Sources

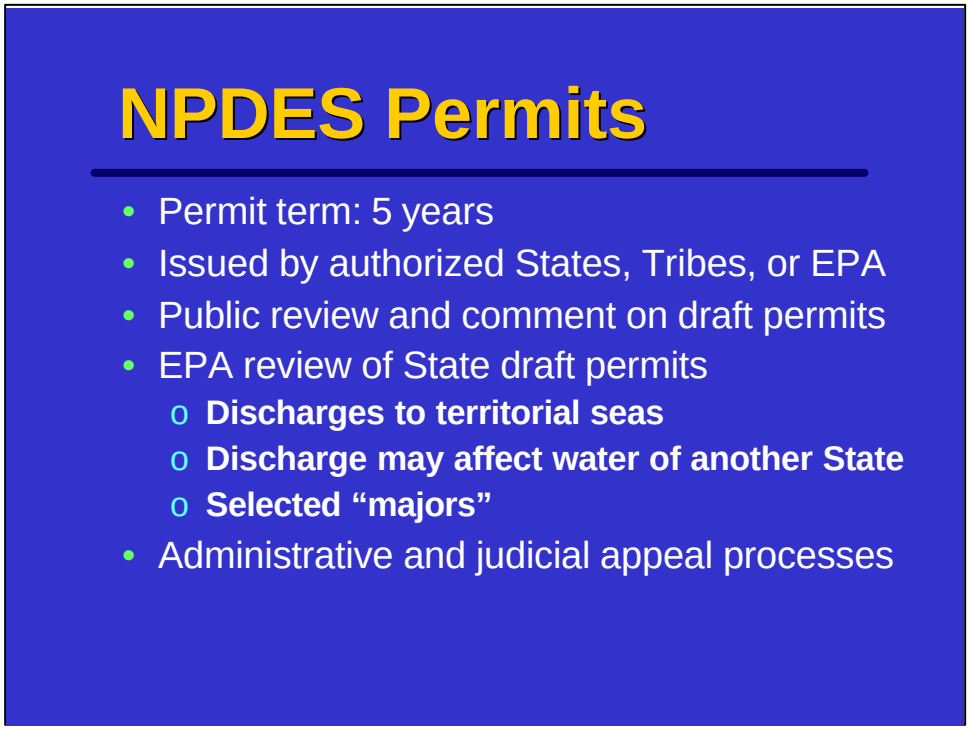
- Entirely exempted
  - Return flows from irrigated agriculture (statutory)
  - CERCLA cleanups (functional equivalent)
- Can be included, case-by-case
  - Logging roads meeting PS definition
  - Smaller feedlots and aquaculture facilities (AFOs)

Also, "indirect dischargers" exempted (though covered by pretreatment program)

- By an act of Congress, return flows of drain water from irrigated fields and croplands are exempted from NPDES, regardless of whether they meet the criteria used to determine if a source is a point source discharge.
- In general, drainage ditches along highways and roads fit the characteristics of point sources–assuming the runoff they collect eventually flows into a water of the U.S. Drainage ditches along roads constructed to gain access to harvestable timber fall into this broad category. However, EPA has not extended automatic categorical inclusion under NPDES to these ditches. Nevertheless, specific stretches of such ditches can be designated for NPDES coverage if the permitting authority determines they are contributing to site-specific water quality problems.
- Confined animal feeding operations (CAFOs) are covered by NPDES. This has been the case for many years, but only in the last decade have EPA and States paid particular attention to this category of sources. Whether an individual facility (dairy, feedlot, fish farm) is covered depends on the number of animals confined, how many days per year they are confined, how close the facility is to surface water, and other factors.



- As noted in the previous slide, "indirect" dischargers of wastewater are not subject to NPDES. An indirect source sends its wastewater into a municipal sewer system, where it is mixed with wastes from other sources and sent to a municipal sewage treatment plant. (Such municipal plants are referred to as ***publicly owned treatment works*** (POTWs), sewage treatment plants (STPs), or wastewater treatment plants (WWTPs)).
- A facility does not, however, become entirely exempt from CWA regulation simply because it changes from "direct" to "indirect." Rather, ***indirect dischargers*** are covered by the ***pre-treatment program***.



- The appeals process is available not only to regulated sources, but also parties that could be affected by the regulated discharge.
- "Major" facilities are those classified as such by the Regional Administrator or authorized State Director. Major municipal dischargers include all facilities with design flows of greater than one million gallons per day and facilities with EPA- or State-approved industrial pretreatment programs.
- Major industrial facilities are identified using a formula that includes factors such as discharge volume and amounts of toxic chemicals. Majors not only are more likely to be subject to higher levels of permit review, but also receive more careful attention regarding compliance with permit conditions.

NPDES Permits

- General permits

  Similar sources
  - Same requirements for all
  - Minimal reporting
  - Notice of intent vs. passive coverage

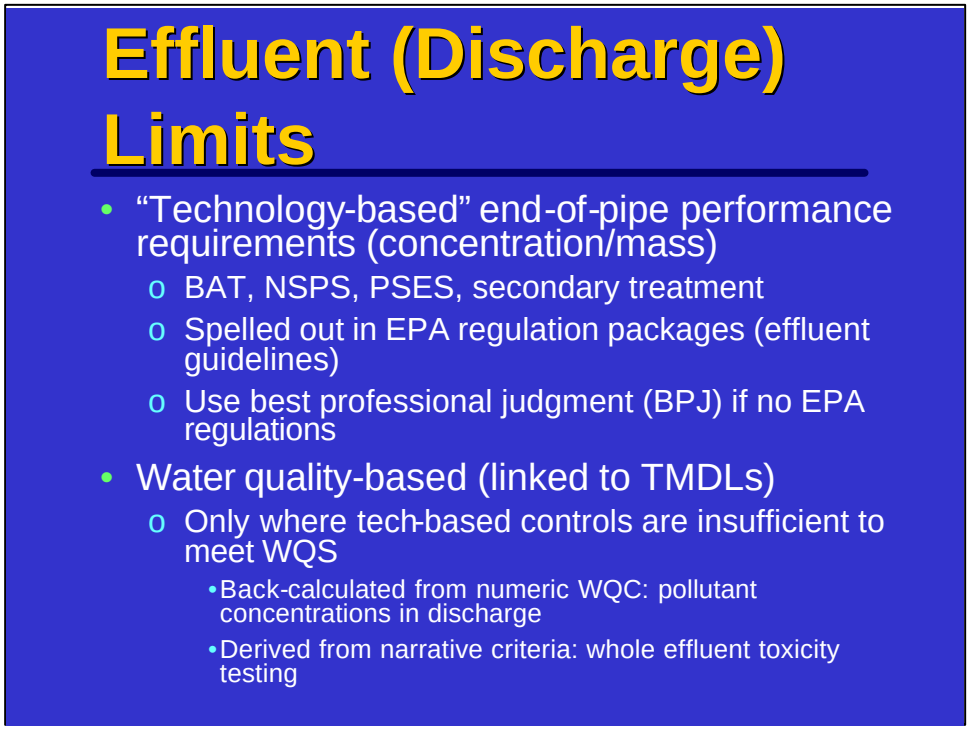
- Individual permits
  - All point sources not covered by general permits must obtain (no *de minimis* exemption)
  - Required to submit detailed permit application form, including data on actual/expected levels of pollutants in discharge

- For administrative convenience and to reduce workload, EPA and States exempt some point sources from getting individual NPDES permits. Rather, they are covered under "***general permits***." General permits are issued to categories of sources that are very similar to each other.
  - Approximately 52,000 entities are covered by 200 non-storm water general permits.
  - Approximately 385,000 entities are covered by storm water general permits.
- The ***same requirements apply*** to all the sources covered by the permit. Usually, these are management practices, rather than end-of-pipe limits.
- Facilities covered by general permits usually have minimal, or no, reporting requirements, in contrast to facilities covered by individual NPDES permits.
- Most general permits require facilities that wish to be covered by the permit to submit a ***Notice of Intent*** (NOI) to the NPDES authority. Absent a NOI, the facility would be considered to be discharging without a permit, and therefore subject to enforcement actions. Some general permits do not require a NOI, allowing any facility that meets the description in the permit of the types of facilities covered to be automatically covered.
- The permit application forms submitted by entities covered by ***individual permits*** contain information about the pollutants generated and discharged by the facility. Approximately 60,000 entities are covered by individual permits:
  - Majors: 4,100 POTWs, 3,300 others
  - Minors: 11,000 POTWs, 42,500 others

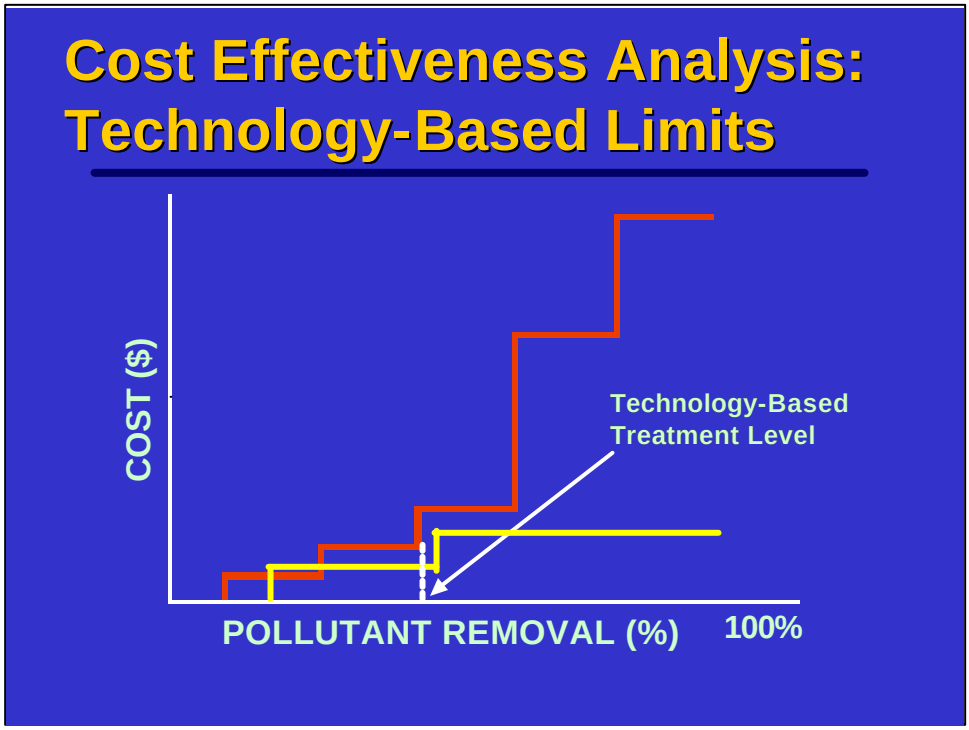
NPDES Permits: Elements

- Effluent limits
- Best management practices
- Compliance schedule
- Monitoring requirements
- Reporting requirements
- Reopener provisions
- For POTWs only: pretreatment program and sludge management program

- NPDES permits may contain several elements.
- Effluent limits:
  - Limits must ensure meeting WQS
  - Maximum daily and monthly average limits for most
  - POTWs–weekly average instead of daily maximum
  - Expressed as mass–directly and indirectly
- Best management practices:
  - Production process modifications
  - Operational changes
  - Materials substitution
  - Materials and/or water conservation
- A compliance schedule can not exceed the permit's 5-year term.
- Monitoring requirements:
  - Self-monitoring by permittee
  - Traditionally effluents only, increasingly ambient
  - Specifies parameters and tests
  - Specifies frequency
- Reporting requirements:
  - Discharge Monitoring Reports to permitting agency usually monthly, but sometimes less frequently
- Reopener provisions: standard clauses giving the permitting authority the right to reopen the permit, for certain specified reasons, before the end of the permit's term.
- For POTWs only: Pretreatment program and sludge management requirements



- There are two basic types of limits, as we've mentioned before—technology-based and water quality-based.
- *Definitions:*
  - **BAT**—Best Available Technology
  - **NSPS—**New Source Performance Standards
  - **PSES—**Pretreatment Standards for Existing Sources (applies to indirect dischargers, which do not need NPDES permits)
  - **PSNS—**Pretreatment Standards for New Sources (applies to indirect dischargers, which do not need NPDES permits)

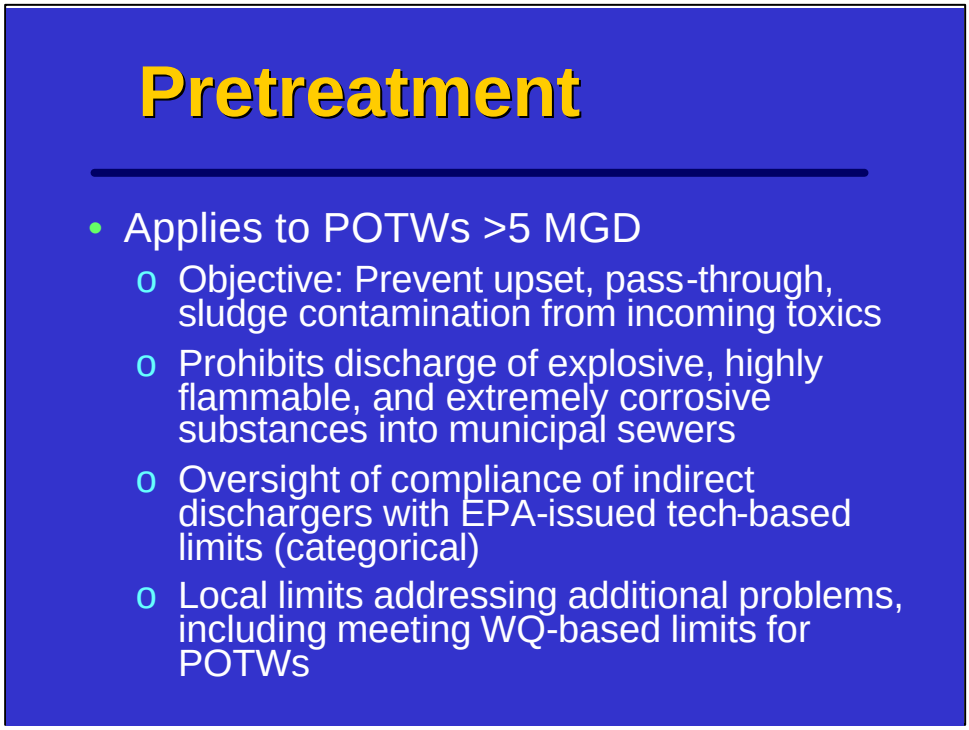


- This slide illustrates the basic approach used by EPA in setting the end-of-pipe technology-based requirements that apply to all facilities in a given category of industries across the nation.
  - The x-axis tracks the degree to which a pollutant of concern has been eliminated from a facility's wastewater, going from no removal on the left to total removal on the right.
  - The y-axis tracks the cost of reducing levels of a pollutant in the effluent of the affected facilities. As a general rule, EPA follows the cost curve out to the point where achieving the next increment of reduction results in a disproportionate increase in costs.
- In reality, over the decades, EPA has worked out with the Office of Management and Budget a series of threshold costs per pound. Regulations with cost effectiveness below the lowest of these "triggers" receive little OMB scrutiny. Ones in the mid-range are given careful analysis. Ones at the high end will meet with considerable OMB resistance.
- Suppose that studies on a different industrial category or a review of the same category years later yields a cost curve that looks like the yellow line. In this case, EPA probably would set the effluent guideline for this particular pollutant at zero. This is where the zero-discharge goal of the CWA goes from being more than a philosophical statement by Congress to an enforceable regulation issued by EPA.

Technology-Based Requirements for Municipal Discharges: Secondary Treatment

	30-Day Average	7-Day Average
5-Day BOD	30 mg/L	45 mg/L
TSS	30mg/L	45 mg/L
pH	6-9	
Removal	85% of BOD_5 and TSS	

- Nothing is said about specific treatment technologies to be employed. These are end-of-pipe ***performance standards***. That is, just because they are called "technology-based" does not mean they require the use of a particular treatment technology.
- The 85 percent removal requirement is in addition to the 30 mg/L (30-day average) and 45 mg/L (seven-day average) secondary treatment standards for BOD_5 and TSS.



- The Federal pretreatment program deals only with toxic chemicals.
- Definitions:
  - ***Upset***—Incoming toxics kill the "bugs" in the POTW's biological treatment units, rendering that stage of treatment ineffective.
  - ***Pass through***—Toxics go right through the POTW and into the receiving waters, without being removed or changed to less harmful forms or sets of byproducts.
- Local governments, as operators of POTWs are responsible for ensuring that all indirect discharges to their systems are complying with the Federal technology-based requirements otherwise known as categorical limits. Local governments establish and enforce local limits.
- Local limits under the pretreatment program are the equivalent of water quality-based limits under NPDES. They go beyond national technology-based limits and are imposed only when necessary to address site-specific problems.

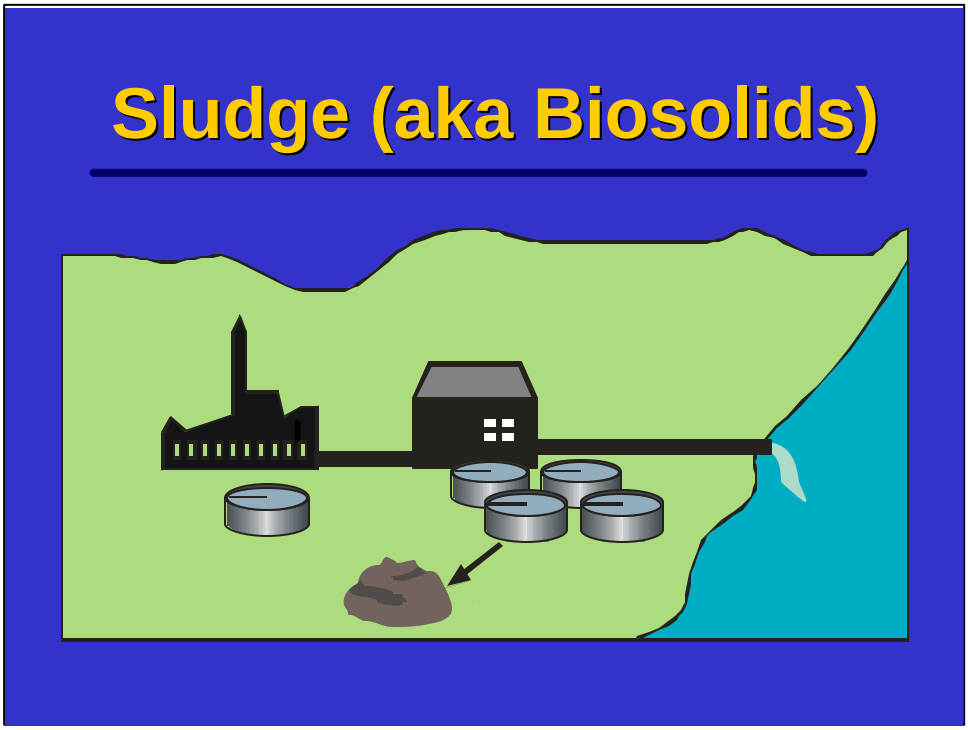
Effluent Guideline Excerpt

Metal Finishing Subcategory

	Direct Dischargers				Indirect Dischargers			
	BAT		NSPS		PSES		PSNS	
	1-day (mg/L)	30-day (mg/L)	1-day (mg/L)	30-day (mg/L)	1-day (mg/L)	30-day (mg/L)	1-day (mg/L)	30-day (mg/L)
Cadmium	0.69	0.26	0.11	0.07	0.69	0.26	0.11	0.07
Copper	3.38	2.07	3.38	2.07	3.38	2.07	3.38	2.07

Note: Several other parameters also are limited but are not included here

- This is an actual excerpt from the *Code of Federal Regulations*, showing examples of what is covered in a typical EPA Effluent Guidelines package.
- For cadmium, limits on new sources (NSPS, PSNS) are more stringent than those for existing sources (BAT, PSES), because new facilities can build pollution prevention and other techniques into their systems. This pattern does not always hold. For copper, BAT, NSPS, PSES, and PSNS are all the same. Note that for both chemicals, BAT and PSES are the same, as are NSPS and PSNS. Limits for direct and indirect dischargers are the same.



- The pollutants removed from the municipal wastewater stream do not disappear; rather, they create sludge, which must be disposed of or used in some beneficial way.

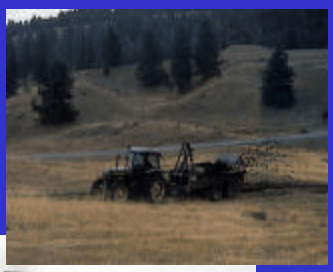
Municipal Sewage Sludge (Section 503)

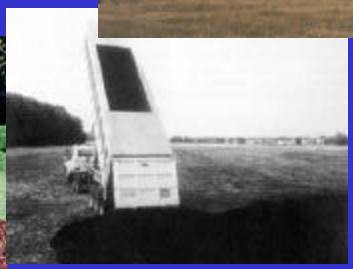
- EPA regulations dealing with disposal and use of sewage sludge
- Addresses toxics, pathogens, and vectors
- Generators, processors, disposers, and users usually need a permit
- Sludge disposal
  - Monofills
  - Mixed municipal solid waste landfills (RCRA)
  - Land application, impoundments and lagoons
  - Incineration (CAA)

- EPA has published national regulations dealing with municipal sludge. The regulations focus on toxics and are included in NPDES permits for POTWs.
- Sludge is often disposed of in one of two types of landfills. Monofills hold only one kind of waste—in this case, municipal sewage sludge. The regulations also address disposal of sludge in landfills that hold all types of municipal solid waste. These landfills are subject to the municipal landfill guidelines under RCRA.
- Sludge can also be applied to the land. It can be spread on the land, to serve as a soil enhancer or fertilizer. This is often done with parks, golf courses, abandoned mines, and construction site restoration. It also can be applied to crops, including crops for human consumption.
- Sludge can also be incinerated. Emissions limits are based on Clean Air Act criteria.

Beneficial Sludge Uses

- Agriculture and forest land
- Parks and golf courses
- Land reclamation sites
- Home gardens and lawns





- Biosolids quality (metals, pathogens, vectors) affects allowed methods of use. Rates and cumulative loadings are considerations in determining whether and how biosolids should be applied to the land. The necessary extent of monitoring and tracking is also considered.
- "Exceptional Quality" biosolids is the name given to treated residuals that contain low levels of metals and do not attract vectors. In general, exceptional quality (Class A) biosolids used in small quantities by general public have no buffer requirements, crop type, crop harvesting or site access restrictions. When used in bulk, Class A biosolids are subject to buffer requirements, but not to crop harvesting restrictions.

Domestic Septage

- Septage - liquid or solid removed from a septic tank, cesspool, portable toilet
- 40 CFR Part 503 rules imposed if septage is applied to land with high human contact potential
  - Parks, ballfields, cemeteries, plant nurseries, golf courses
- Less burdensome requirements imposed if septage is applied to nonpublic contact sites
  - Agricultural land, forests, reclamation sites

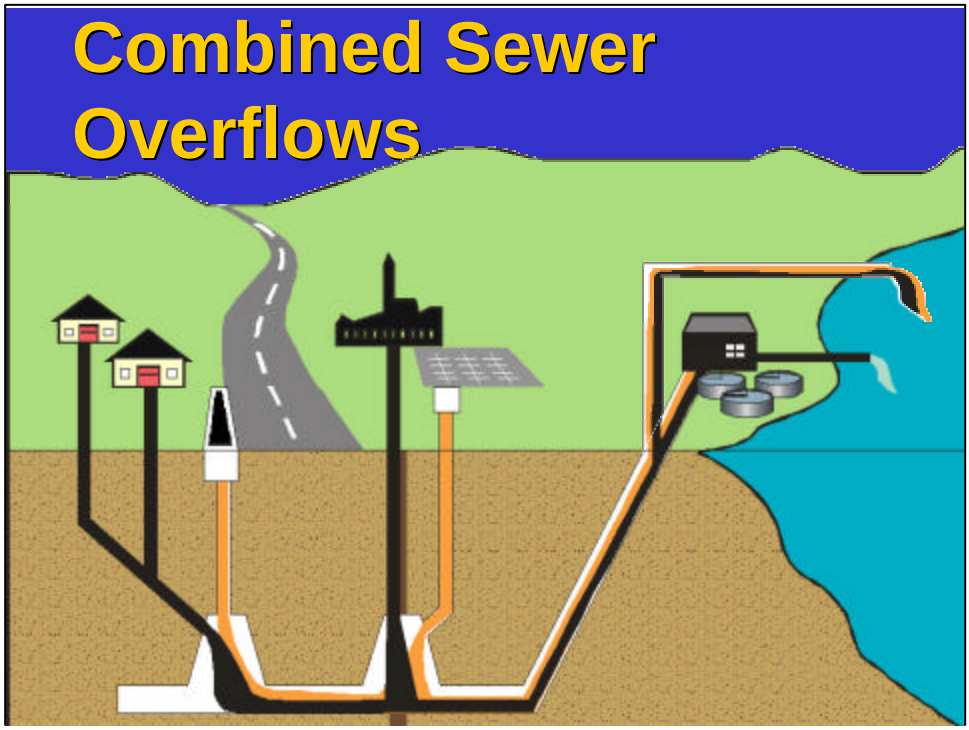
- In general, septage should be hauled to the local municipal sewage treatment plant, where it can be properly treated. However, Federal permits are not required for persons who apply domestic septage to non-public contact sites. If the domestic septage is treated in a central facility, the treatment facility may need to apply for a permit.

Municipal Wet Weather Flows

- The section on municipal wet weather flows will focus on ***combined sewer overflows***, or CSOs, and ***municipal separate storm sewer systems***, also called MS4s.
- CSOs and MS4s are subject to regulatory controls under Section 402 of the Clean Water Act, which deals with discharges permitted under the National Pollutant Discharge Elimination System (NPDES) program. We've already discussed how the NPDES program is set up, how it operates through delegated state programs, and how it's designed to address technology-based and water quality-based protection of surface waters. Now we're going to talk about how a specific set of discharges—from improperly functioning sewage systems and polluted runoff—are handled under Section 402.

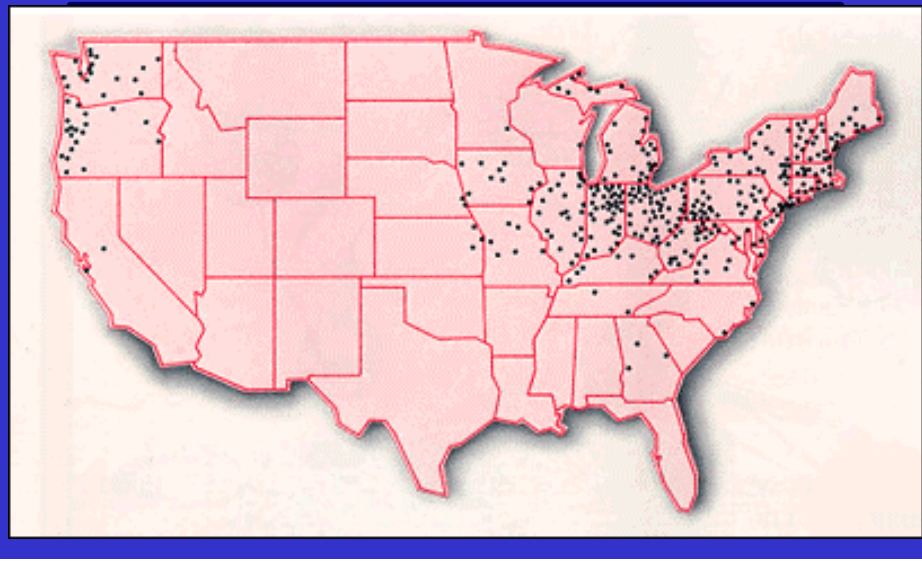
MS4/CSO Permits: Special Features

- Can do system-wide permits rather than outfall-by-outfall
- Often no end-of-pipe pollutant limits, but may be included
- Application of various types of BMPs required
- Strategic plans for addressing problems required
  - Opportunity for public input
  - Links to land use issues

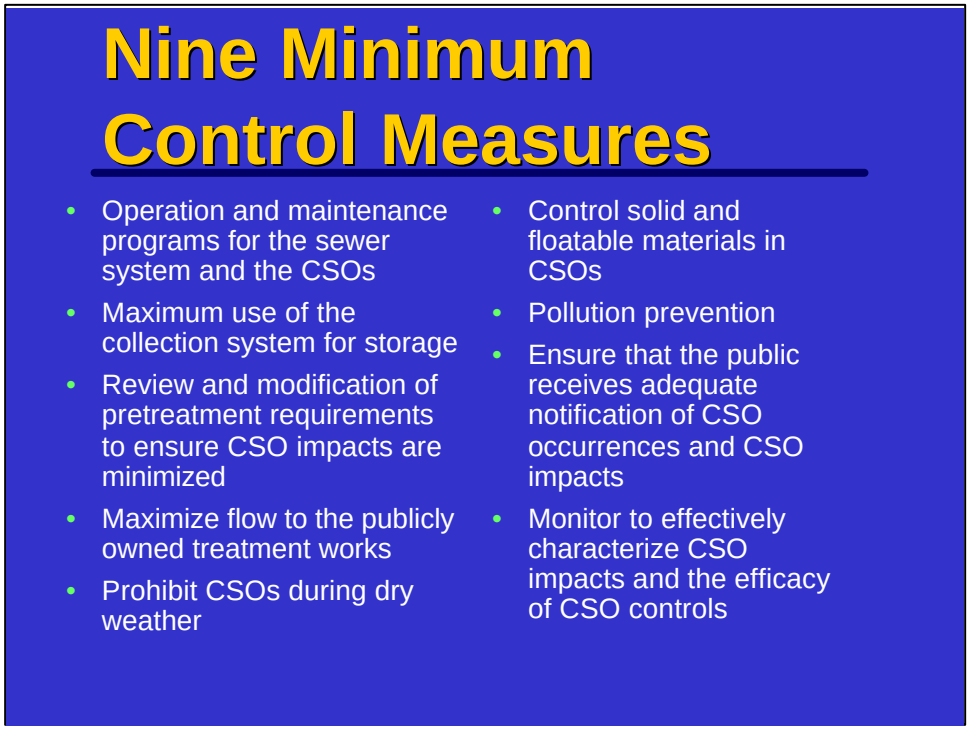


- A combined sewer system is one which, by design and by function, carries both sanitary sewage and storm water. During dry weather these systems should carry all sanitary flows to the wastewater treatment plant for full treatment to meet water quality standards as specified in the NPDES permit. Untreated discharges from combined sewer systems during dry weather are prohibited.
- During periods of rainfall or snow melt, the sewer collection system carrying capacity may be exceeded, causing a combined sewer overflow (CSO) at relief points in the sewer system. These relief points are often designed into the sewer system to prevent street and basement flooding or overloading of the wastewater treatment facilities. CSOs contain not only storm water but also untreated human and industrial waste, toxic materials, and floating debris. They can cause beach closings, shell fishing restrictions, and other waterbody impairments.

CSOs in the U.S.



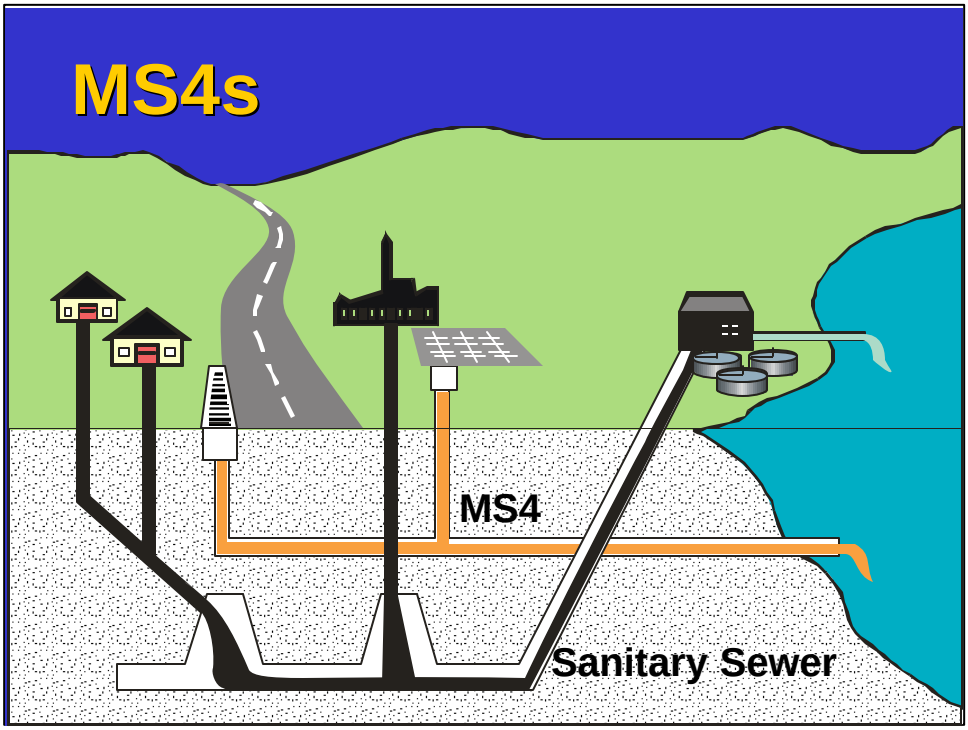
- You can see the extent of CSOs across the country in this map–they're mostly in the northeast quadrant of the nation, since they're associated with older sewage collection systems that tended to merge storm water and sewage piping.
- CSOs are not subject to secondary treatment requirements, but the still have to meet water quality-based and technology-based standards under NPDES permits to comply with the Clean Water Act. Based upon EPA's 1989 CSO strategy and the 1994 National CSO Policy, CSO communities are required to implement nine minimum control technologies and to develop a long-term CSO control plan to meet water quality standards.



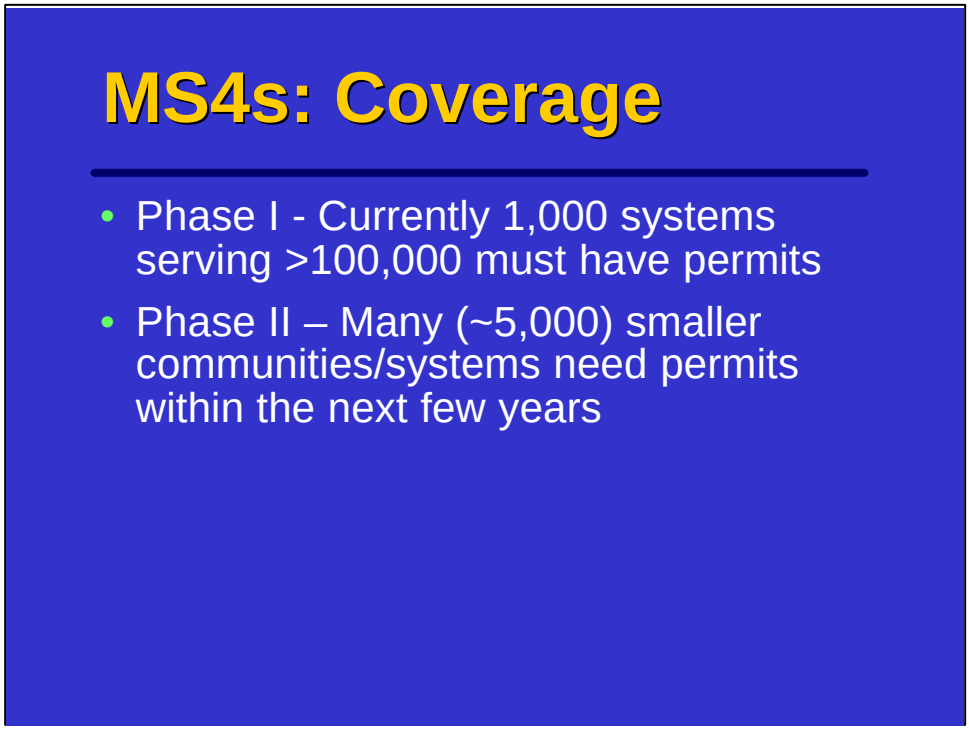
- The nine minimum controls are generally met through management of the existing combined sewer system, while the long-term controls will involve capital improvements such as the retention and treatment, or sewer separation. The controls are:
  - Characterization, monitoring and modeling of combined sewer systems;
  - Public participation;
  - Consideration of sensitive areas;
  - Evaluation of alternatives;
  - Cost/performance consideration;
  - Operational plan;
  - Maximizing treatment at the POTW treatment plant;
  - Implementation schedule; and
  - Post-construction compliance monitoring program.

CSO Long-Term Control Plans

- In addition to 9 minimum measures
- Goal: Achieve WQS or other CWA requirements
- Priority: Eliminate, relocate, or treat CSOs in sensitive areas
  - **Primary contact recreation sites**
  - **Shellfish beds**
  - **Drinking water intakes**
  - **T&E species and habitats**



- While combined sewer systems have one set of pipes to carry both storm water and wastewater, municipal separate storm sewer systems (MS4s) have separate lines–one set for the storm water, another set for sewage.
- We've discussed how sewage collection and treatment systems are required to get an NPDES permit under Section 402 for the discharge of their treated effluent into surface waters. MS4s that discharge to surface waters, which are nearly all of them, are also required to get NPDES permits.

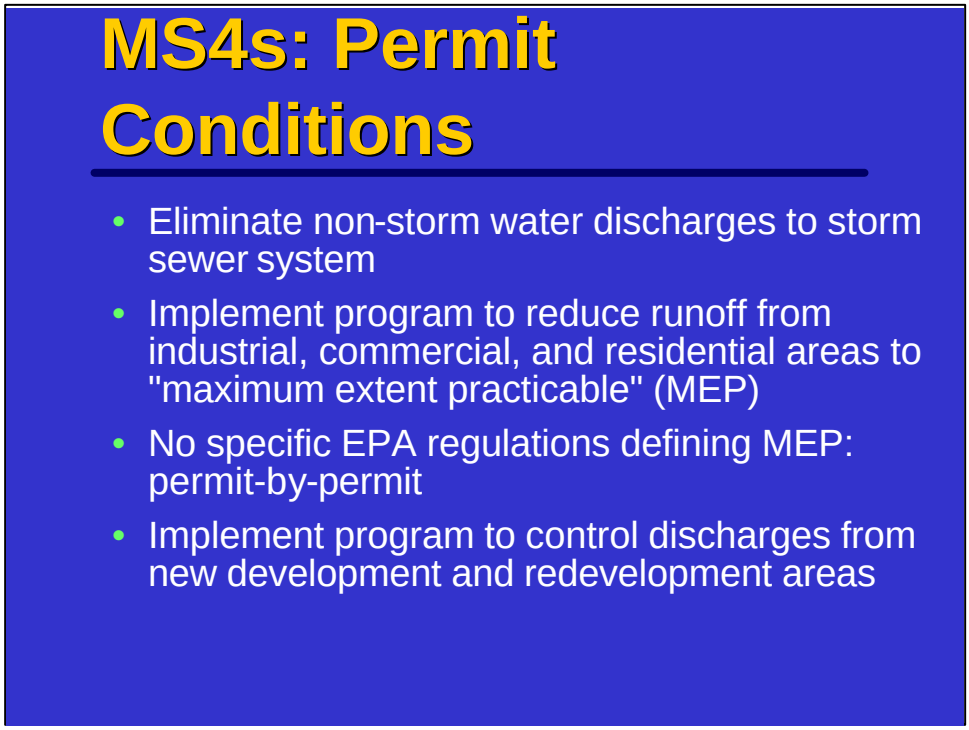


- The storm water control program was prompted by a lawsuit filed by the Natural Resources Defense Council (NRDC) against EPA in the 1980s. The 1987 amendments to the Clean Water Act made regulation of storm water a priority, and established a phased system of storm water management.
- Under the approach worked out by EPA, NRDC, and the court, the storm water control program was implemented by Congress in two phases during the 1990s. Phase I, which rolled out in 1990, required individual permits for medium and large MS4s. Medium MS4s are those serving cities with populations over 100,000; large MS4s serve cities of more than 250,000.
- "Small" MS4s include systems serving 50,000 people, plus smaller systems integrated into systems of this size.

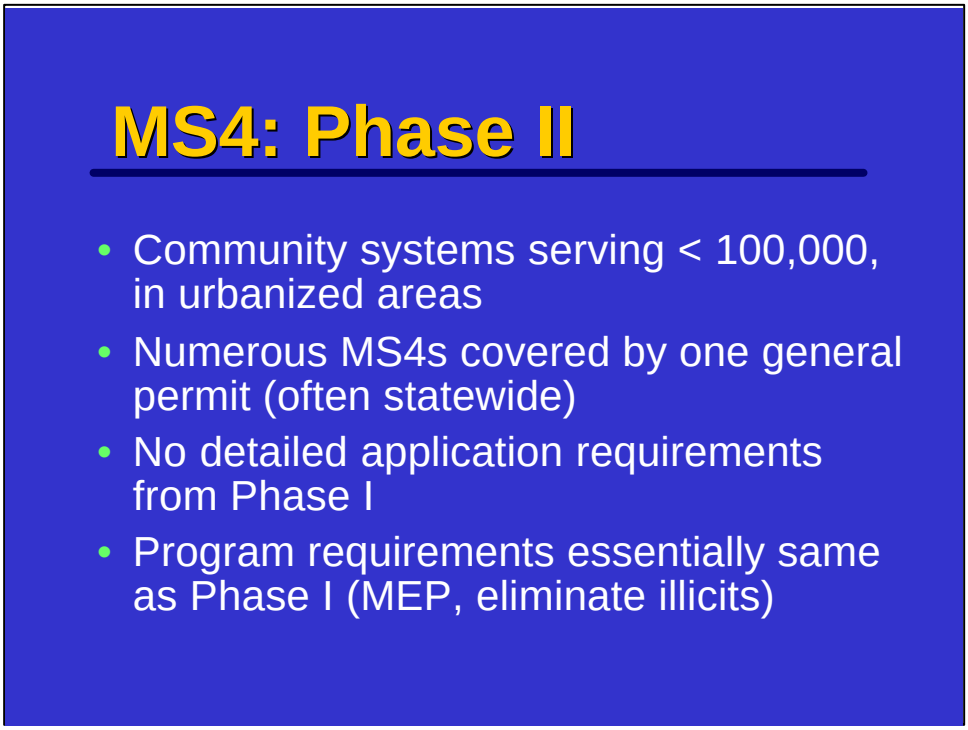
Phase I MS4s: Application Requirements

- Map system, including outfalls
- Sample and analyze representative outfalls
- Identify key categories and individual sources
- Describe current land use activities, with estimates of population densities
- Describe projected growth for a 10-year period
- Describe existing authority and programs to keep pollutants from entering the MS4
- Assess the proposed storm water program

- The conditions of an MS4 permit seeks first to generate specific information about the storm water collection system and the types and amounts of pollutants it transports, then to define management practices designed to identify potential solutions.
- Though it may surprise some, producing a detailed map of a city's sewer system is often not a simple job, particularly in older cities. Sewers were laid piecemeal, as cities grew. Records of their location were often lost, or never filed in the first place.

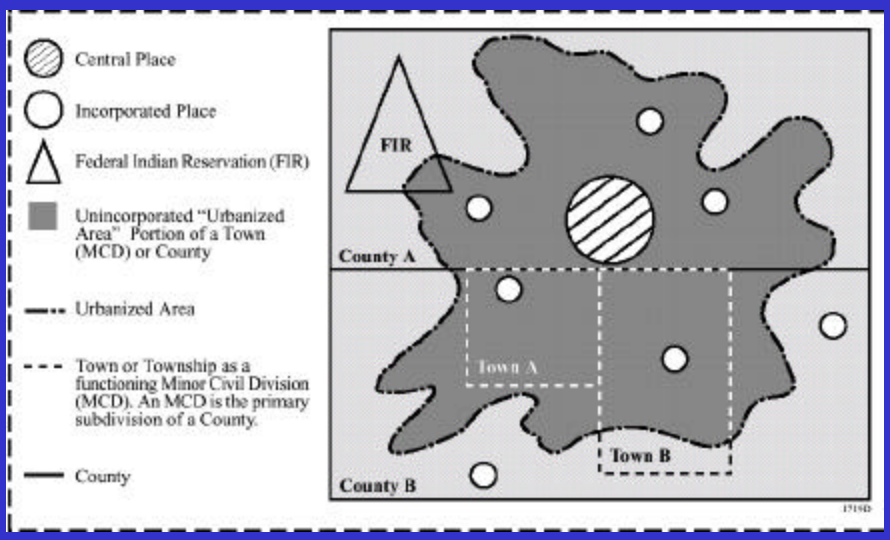


- Eliminating non-storm water discharges is a key consideration in this process. Finding illicit connections can be as simple as identifying storm water system outfall flows during periods of dry weather and tracking them upstream through the system piping to locate the source.
- The pollution reduction standard for MS4s is the “maximum extent practicable” rather than a more stringent standard like “best available technology.” Since MS4 permits deal with polluted runoff, there is considerable focus on land use, land cover, and projected development over a 10-year period. The practical effect of this approach will be to drive attention to significant sources of polluted runoff and perhaps even large impervious areas that collect and provide hydraulic drive to storm water flows, like large parking lots.
- Local government officials responsible for developing, implementing, and maintaining storm water permits will have to focus their efforts on site-level BMPs if they hope to have any impact on polluted storm water runoff.



- Smaller cities–those with more than 50,000 people, and adjacent census tracts with more than 1,000 people per square mile–are covered under the Phase II regulations, which were published in December 1999. The Phase II rollout has begun, and will be finalized by March 2003, when all regulated systems must have permits. Implementation of permit provisions is required within 5 years after a permit is issued, or by 2008 at the latest.
- The primary differences in the way Phase I and II communities are handled are:
  - States are allowed to issue just one statewide general permit covering all small MS4s; whereas large systems were required to obtain individual permits.
  - The application requirements for Phase II systems are much simpler.

Population Density



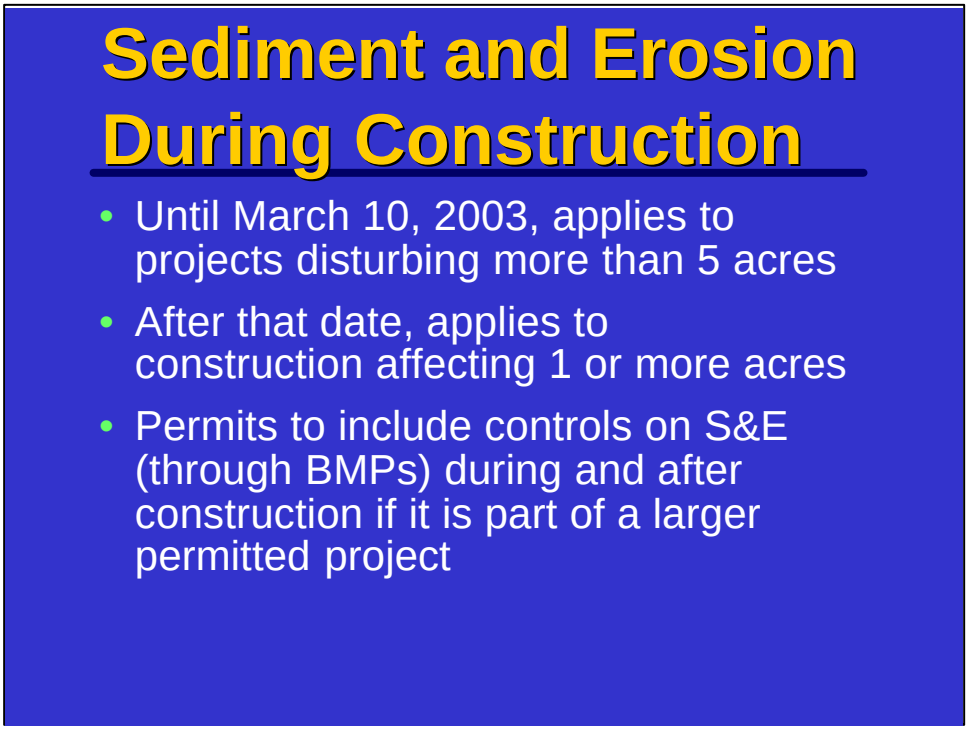
- This diagram shows how a populated area near a regulated city of 50,000 or more people can fall under the storm water Phase II regulations. The city, shown as the circle in the center of the populated "blob," has some incorporated and unincorporated areas around it. The "urbanized area," that is, the area with more than 1,000 people per square mile, is the shaded blob.
- Town A is clearly within the urbanized area, and will have to either apply under the general permit provisions of Phase II or piggyback on the permit of the central city, shown by the hash-marked circle in the middle. Town B will have to do the same for the urbanized area within its jurisdiction.

- There are some similarities between the Phase I and Phase II programs. The permits cover the entire storm water sewer system rather than each discharge point, and generally describe an overall storm water management program that includes public involvement, better management of land use impacts, and other BMPs.
- The schedule for Phase II is fairly ambitious, with general permit programs required to be in place by December 2002. Most States will probably operate these general permit programs under their delegated NPDES programs. Forty-three States have full delegated authority to operate the Clean Water Act Section 402 NPDES program.

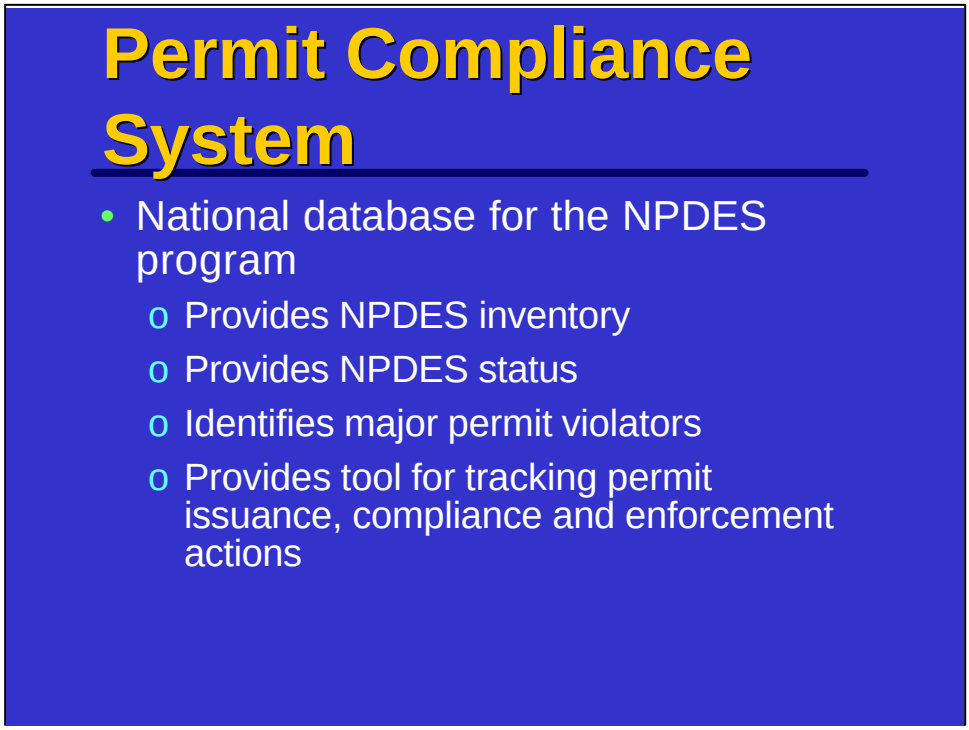
Phase I: Industrial Storm Water

- Facilities with effluent limits
- Manufacturing
- Mineral, metal, oil, gas
- Hazardous waste facilities
- Steam electric plants
- Construction disturbing more than 5 acres
- Recycling facilities
- Transportation
- Treatment works
- Landfills
- Light industry

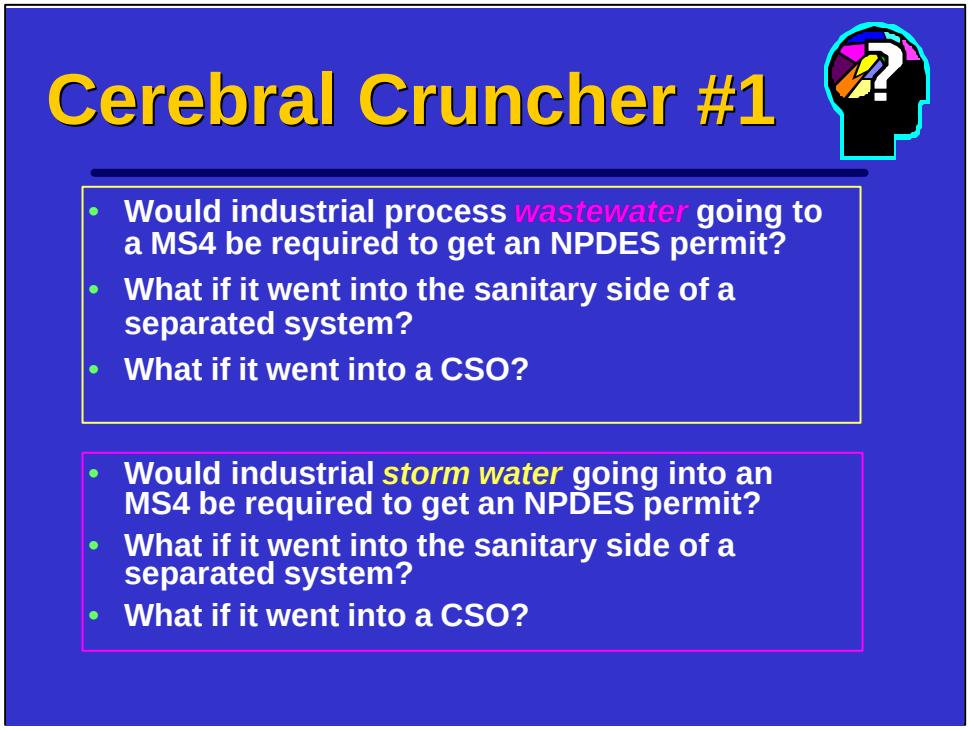
- These are the industrial categories subject to the storm water permit requirements. More information on each of these–and specific definitions and permitting information–can be found at http://www.epa/gov/owm.



- Both phases of the storm water program address construction sites, with Phase I covering sites larger than 5 acres and Phase II covering sites larger than one acre. The reasons for covering construction sites are fairly obvious–erosion rates from construction sites can be two to nearly twenty times higher per acre than erosion from row crop land. About 115,000 construction sites annually will be covered by the storm water permitting program when it's fully implemented. The States will likely handle this glut by issuing general permits.
- With such a high number of permittees, it is clear that most will undergo little, if any, oversight by States or EPA. Hence, the success of this program will, of necessity, rely on the good will of developers and the diligence of local officials and interested citizens.

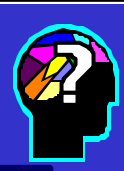


- The Permit Compliance System (PCS) is the national database for the NPDES program. PCS promotes national consistency and uniformity in permit and compliance evaluation.
- All Regions use PCS directly and authorized States must either use PCS directly or develop and maintain an interface.
- PCS serves several major purposes for the NPDES program:
  - PCS provides the overall inventory for the NPDES program;
  - It provides data for responding to Congress and the public on the overall status of the NPDES program;
  - It encourages proper EPA oversight by identifying all major permit violators; and
  - It offers all levels of government an operational and management tool for tracking permit issuance, compliance, and enforcement actions.



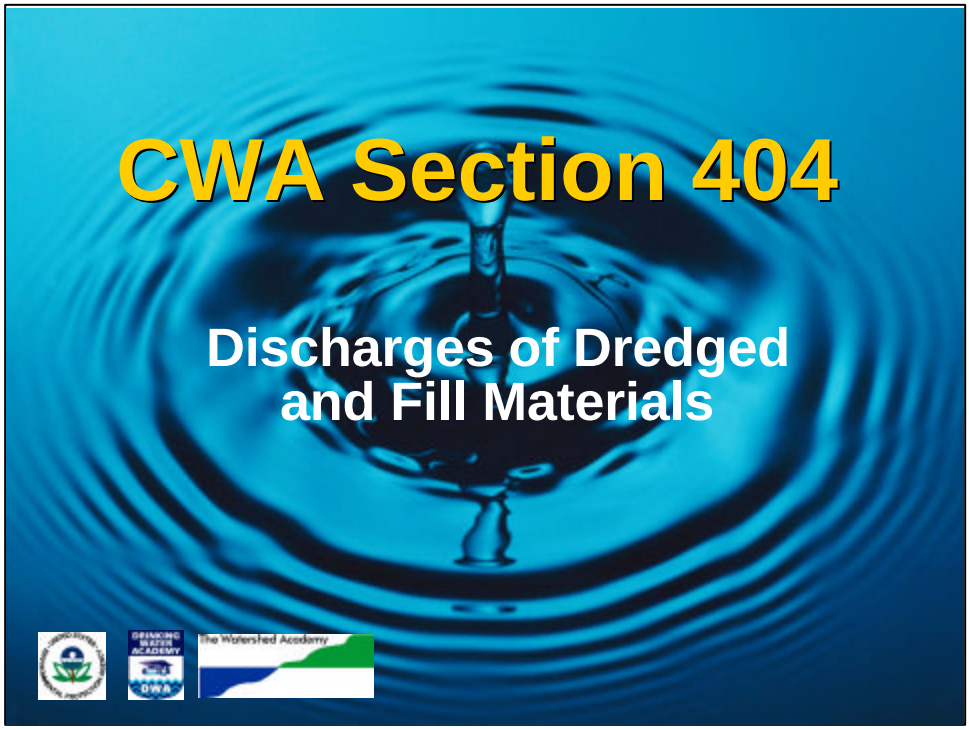
- **Yes**. As we've noted, industrial storm water discharged into surface water requires a permit under the storm water control program. Discharging the storm water into a MS4 has the same practical effect–the pipe is just longer. As time goes on and local governments become more sophisticated in managing storm water quality, they may actually develop a sort of pre-treatment program for large storm water discharges into their MS4s, to control water quality at the discharge point and in the receiving waters. Of course, this is quite a ways off in most cases.

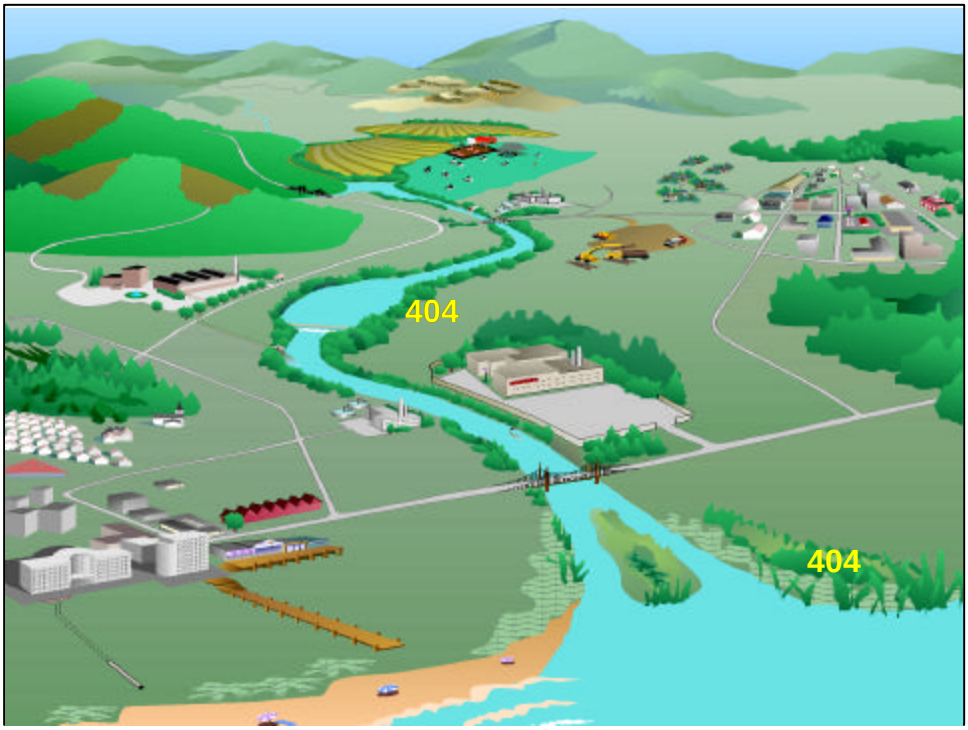
Cerebral Cruncher #2



After shampooing rugs in several homes, a carpet cleaning truck discharges the accumulated rinse water into a nearby storm drain leading into an MS4.

- **Should this require an NPDES permit?**
- **What if the rinse water entered a separate sanitary sewer system?**
- **What if the rinse water entered a CSO system?**


CWA Section 404
Discharges of Dredged and Fill Materials
The Watershed Academy

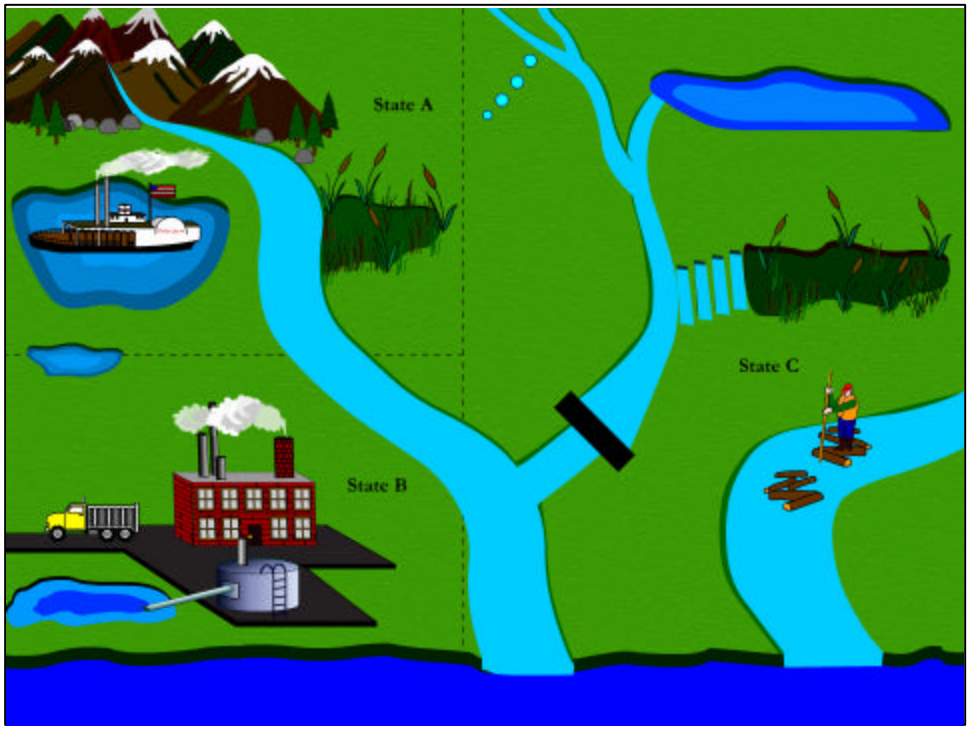


- The next Clean Water Act topic is wetlands, which are mostly regulated under the section 404 provisions governing the placement of dredged or fill material into waters of the United States.
- According to the U.S. Fish and Wildlife Service publication "Wetlands Losses in the United States 1780s to 1980s," Frayer et al. estimated that 87 percent of the wetland losses from the mid-1950's to the mid-1970's were due to agricultural conversion. In colonial America, the area that now constitutes the 50 United States contained an estimated 392 million acres of wetlands. Of this total, 221 million acres were located in the lower 48 States. Another 170 million acres occurred in Alaska. Hawaii contained an estimated 59,000 acres.
- Over a period of 200 years, the lower 48 States lost an estimated 53 percent of their original wetlands. Alaska has lost a fraction of one percent while Hawaii has lost an estimated 12 percent of its original wetland areas. On average, this means that the lower 48 States have lost over 60 acres of wetlands for every hour between the 1780s and the 1980s.
- The data presented in the report indicate that 22 States have lost 50 percent or more of their original wetlands. California has lost the largest percentage of original wetlands within the state (91 percent). Florida has lost the most acreage (9.3 million acres).

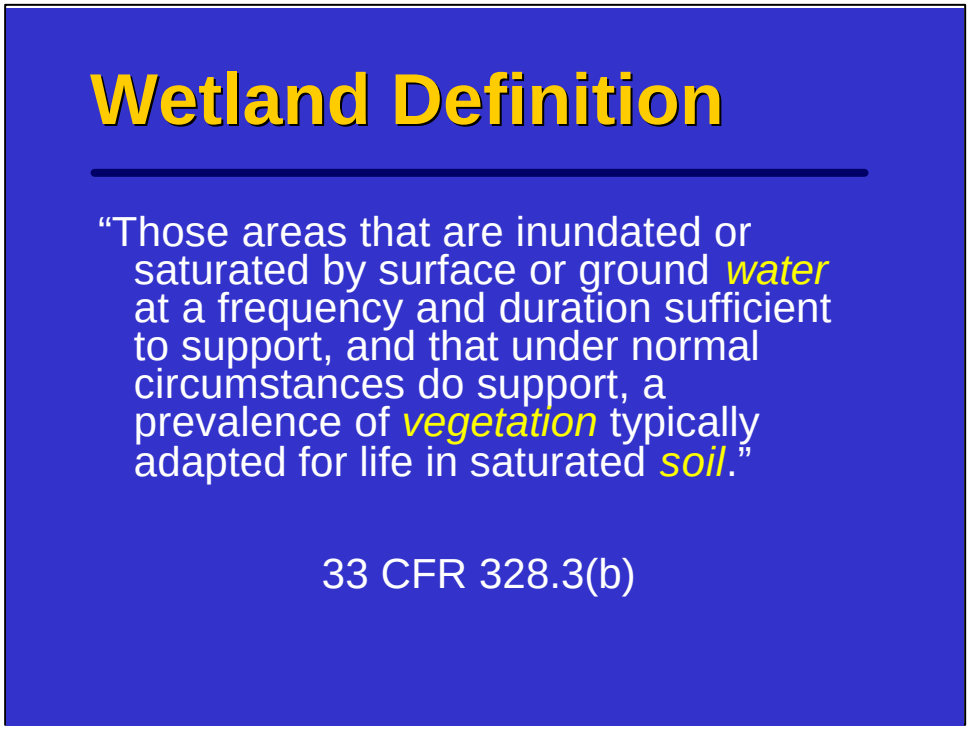
CWA Section 404

. . . establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities that are regulated under this program include fills for development, water resource projects (such as dams and levees), infrastructure development (such as highways and airports), and conversion of wetlands for farming and forestry

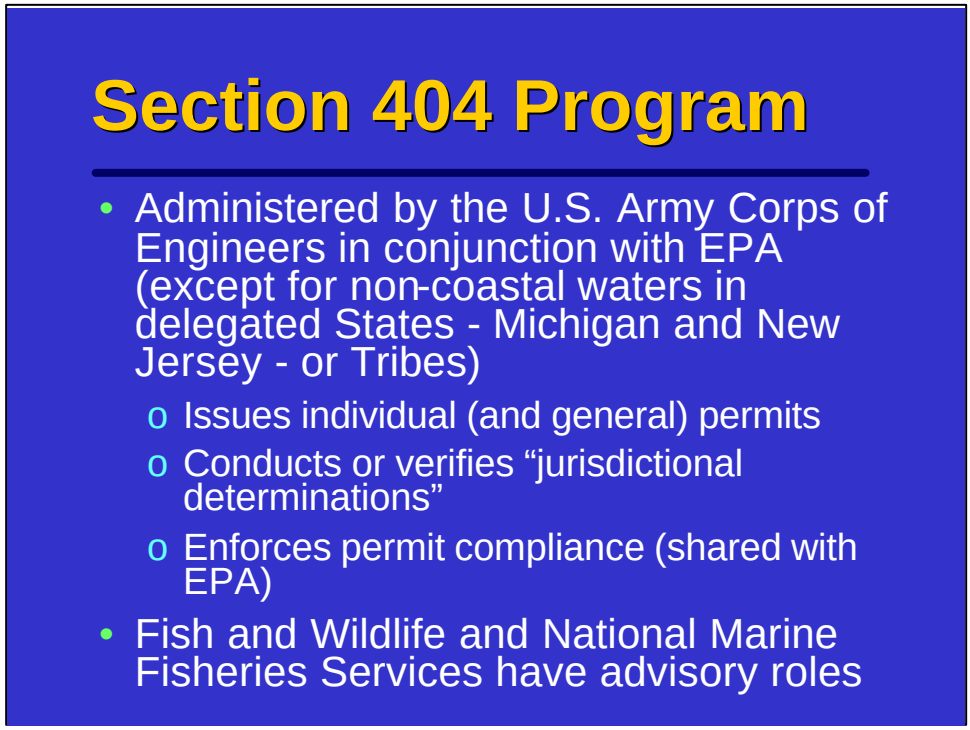
- The famous Two Forks case demonstrates that section 404 does not only deal with wetlands, as it addressed damming of a river.
- Reaffirming the Environmental Protection Agency's ability to enforce the Clean Water Act, a federal judge in 1996 upheld an EPA decision blocking a controversial dam project at the Two Forks site near Denver, Colorado. Several local water districts sought to have EPA's decision overruled so the proposed dam could be built.
- The opinion upheld EPA's determination that the South Platte River Corridor is a unique and irreplaceable resource and that there are other alternatives to the Two Forks dam for future water distribution that would be far less damaging to the environment. The dam would have flooded more than 30 miles of free-flowing river, including some of the best trout fisheries in the country.
- The section 404 program does not regulate the acts of dredging or draining, *per se*. Such projects often come under its scope because they accidentally result in discharge of dirt or silt back into the affected wetland.



- The Secretary of the Army, acting through the Chief of the U.S. Army Corps of Engineers (ACE), is designated under the Clean Water Act as the lead regulatory authority for implementing section 404. ACE regulations define waters of the United States according to these criteria, which were the subject of a recent U.S. Supreme Court decision involving a landfill development northwest of Chicago. Let's review each of these criteria for what are "waters of the United States."
- The Supreme Court decision, Solid Waste Agency of Northern Cook County (SWANCC) vs. USACE (U.S. Court of Appeals, Seventh Cir., 99-178), basically found that isolated wetlands–those that are not "adjacent" to navigable waters or the other waters listed in this slide–are not subject to regulation under the Clean Water Act.
- The ACE had said earlier that the wetlands at the site, an old abandoned gravel pit area that had developed emergent wetlands and habitat for birds–were not adjacent to U.S. waters and were thus subject only to State or local jurisdiction. The ACE and other supporting opinions said that the wetlands were linked to interstate commerce by virtue of the Migratory Bird Treaty, which protects avian habitat important for hunting, wildlife watching, and other activities. But the Supreme Court, in a 5-4 ruling, disagreed. The Court said that an isolated wetland was not a "water of the U.S." simply because it was used by migratory birds. It did not, however, rule out inclusion of isolated wetlands for other reasons.
- The result of that January 9, 2001, ruling potentially removes 30-60 percent of the nation's wetlands from Clean Water Act regulation. Protection of these isolated, non-adjacent wetlands is now largely the responsibility of State and local governments.



- Articulating what defines a wetland is extremely difficult. Some watery areas are obviously wetlands–they have visible, standing water all year, are filled with wetland type plants, and are not considerable useable for typical development purposes. But areas that are dry much of the time also can be classified as wetlands.
- Wetlands are defined by Federal regulations as having three primary attributes: saturation during a specified period, wetland-type plants, and hydric soils. Characterization of hydrology, soils, and vegetation is the subject of an ACE manual on wetland delineation, posted at http://www.wetlands.com/coe/87manp1a.htm.
- Note that different organizations define wetlands different ways. The U.S. Fish and Wildlife Service tends to identify a wetland as an area that displays one or more of the three attributes listed above. The ACE notes that the presence of two indicators probably indicates a wetland is present, but stresses the presence of all three attributes "will enhance the technical accuracy, consistency, and credibility of wetland determinations."
- The most difficult indicator to assess is hydrology. The ACE manual states that "it is essential to establish that a wetland area is periodically inundated or has saturated soils during the growing season," but does not define specifically how often a wetland is inundated or for how long.



- Under CWA section 404, a permit must be obtained before dredged or fill material may be discharged into "waters of the United States," which include many wetlands. This permit program is administered by the Army Corps of Engineers (USACE) or approved States under guidelines issued by EPA. It ensures that the environmental impacts of proposed discharges are avoided and minimized to the extent practicable, and that unavoidable impacts are mitigated or offset through wetland restoration or other activities.
- In 2000 ***Nationwide General Permit 26***, the long-debated "catch-all" authorization that was the single largest source of generally permitted wetland losses, was eliminated. Of the 29,042 activities that were authorized in 1995 under the nationwide permit program, 9,462 activities (32.5 percent) were authorized under NW26, according to an analysis by the Environmental Working Group (EWG). EWG estimates that in 1995 alone, NW26 accounted for impacts to an estimated 7,432 acres out of 15,552 acres (48 percent) of all wetlands and other waters affected by the program in the 27 Corps districts examined.
- The underpinnings of this nationwide permit had been challenged by the National Academy of Sciences, and it was replaced by six activity-specific general permits limited to minimal environmental impacts.
- In addition, in 2000 the threshold for obtaining a Nationwide General Permit was lowered to 1/2 acre (from 10 acres), and significant conditions protecting floodplains and critical resource waters were added. In 2000 EPA worked with the USACE on regulatory changes (known as the "Tulloch Rule") to clarify the scope of activities covered under section 404 to ensure that activities such as mechanized excavation, channelization, and other activities that involve discharges of dredged or fill materials are evaluated under CWA permitting requirements.
- Michigan and New Jersey are approved to administer the Federal permit program. Other States (such as Maine, New Hampshire, Rhode Island, Massachusetts, Connecticut, Vermont, Pennsylvania, and Maryland) administer State Program General Permits (SPGPs) as a means to reduce unnecessary duplication between State and Federal programs. In these (and other States with comprehensive or partial SPGPs) the State's permit can eliminate the need to get a separate permit from the Corps of

Section 404: EPA Role

- Develops environmental guidelines, policies, and guidance
- Reviews permits issued by Army Corps of Engineers (elevation or veto authority)
- Approves and oversees State or Tribal assumption of program responsibility
- Shares enforcement with Corps
- Determines scope of jurisdiction
- Identifies exempt activities
  - Normal farming, silvicultural, ranching operations
  - Some maintenance and emergency repair projects

Section 404: Implementation

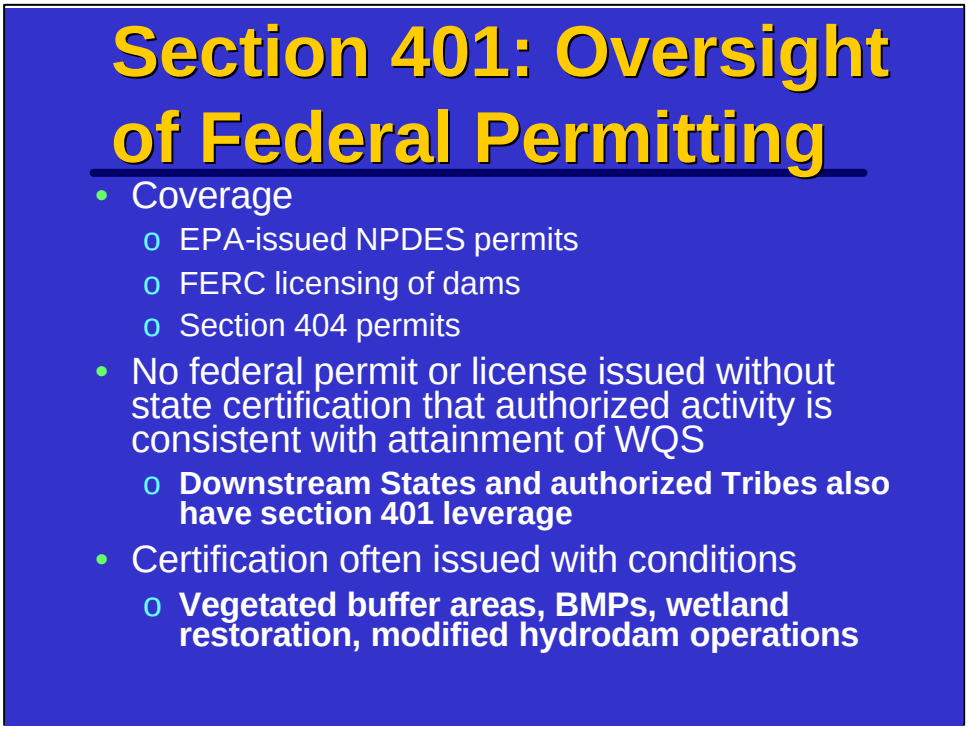
- Avoid impacts
- Minimize effects
- Compensate only after avoidance and minimization

- This is the sequence that ACE and EPA follow to determine whether or not a permit to place dredged or fill material into U.S. waters should be granted.
  - o ***Avoidance***: Avoid impacts to maximum extent practicable.
  - o ***Minimization***: Design project to keep effects on wetlands as small as practicable (only after avoidance).
  - o ***Compensation***: Only after avoidance and minimization:
    - – Restoration, enhancement, creation, or in exceptional circumstances, preservation.
    - – Mitigation banking is a form of compensatory mitigation where "credits" are established in advance of impacts.
- The last step in the sequence, compensation, has prompted the creation of numerous mitigation banks for wetlands. These banks promote the development of new wetlands to offset losses of existing wetlands to development. States will use a ratio to determine how many acres of new wetlands should be created for each acre lost, typically two new acres for each existing acre lost.

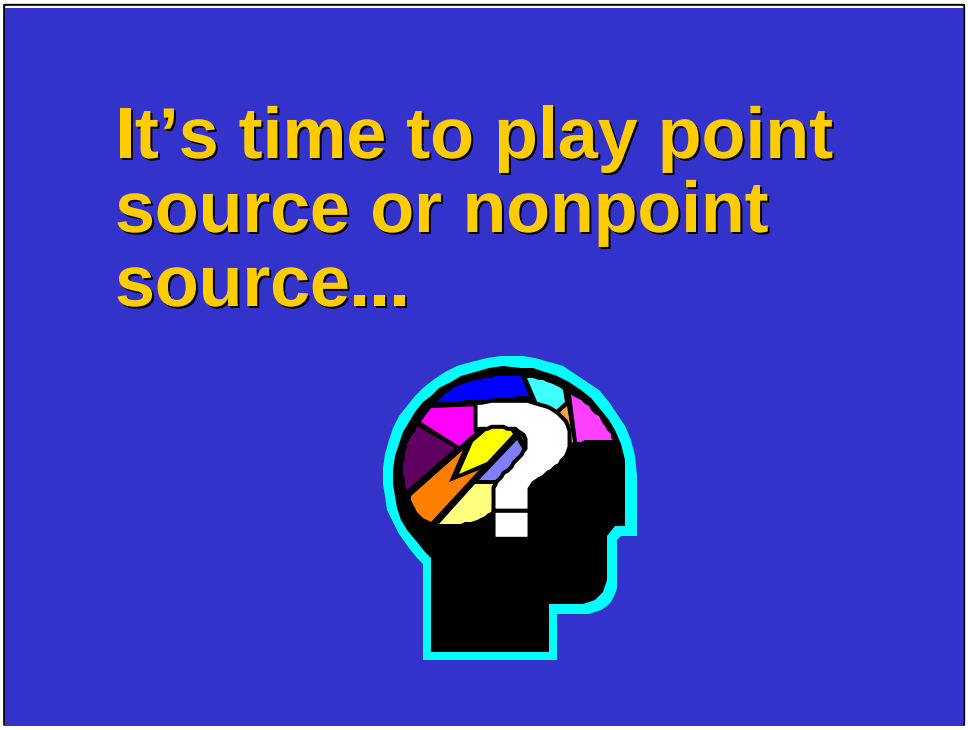
EPA can use the results of source water assessments under SDWA to identify areas that need protection for drinking water sources.

Section 401: Oversight of Federal Permitting Actions

- In the section 401 water quality certification program, instead of Federal agencies looking over the States' shoulders, States determine whether or not projects requiring Federal permits or licenses should go forward. Specifically, States are allowed to certify whether or not these Federally permitted activities will affect State water quality.

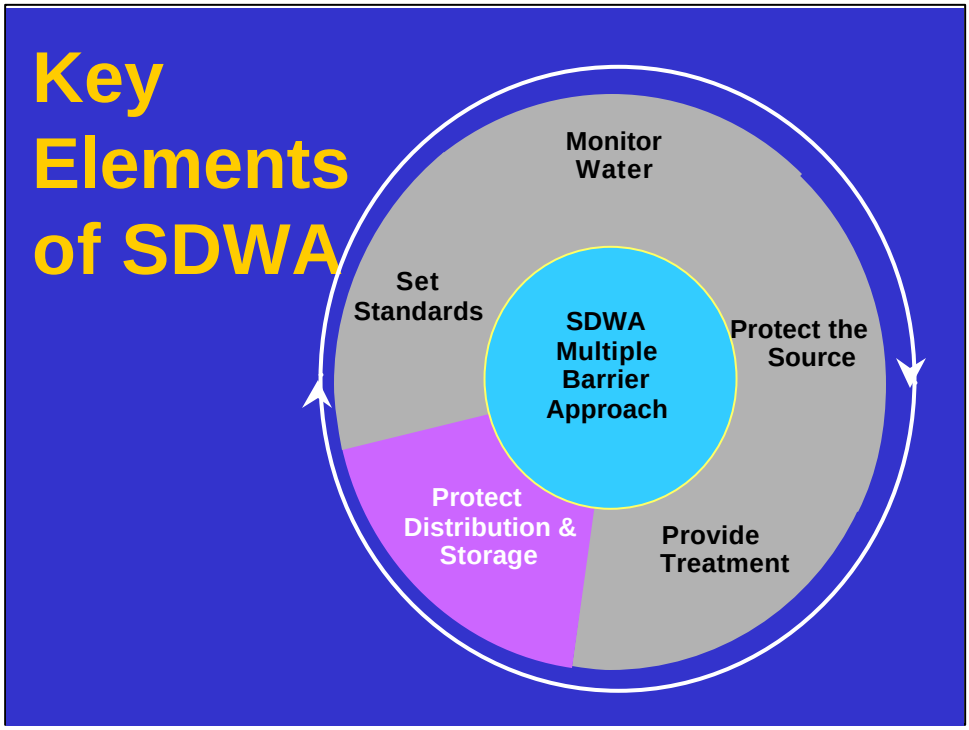


- The three most significant areas of section 401 certification activity are NPDES permits issued by EPA in the seven non-delegated States; licenses for dams issued by the Federal Energy Regulatory Commission; and section 404 permits issued by the ACE.
- Under Section 401, applicants for Federal licenses or permits that might result in any discharge to navigable waters must provide to the licensing or permitting agency "a certification from the State that any such discharge will comply with the applicable provisions" of the Clean Water Act.
- If a State does certify a Federally permitted or licensed activity under section 401, and the permittee or licensee violates the terms or stipulations of its water quality certification, the Federal agency issuing the permit or license may suspend or revoke the license or permit.



- OK, let’s play point source or nonpoint source. This is a series of slides of various facilities and activities. The answer may be “can’t be sure--would need more data.”


Ensure the Integrity of Drinking Water Infrastructure
The Watershed Academy



- Another barrier in the multiple barrier approach is protection of storage facilities and the distribution system. After the water has been treated to meet standards, this barrier ensures that finished water is protected until it reaches consumers. This includes:
  - Pumping facilities;
  - Finished water storage;
  - Cross-connections; and
  - Distribution systems.
- One of the primary means of protection is through minimum design and construction standards. These standards, adopted at the State level, specify requirements for public water supply systems.
- States and EPA also have adopted a number of regulatory and nonregulatory programs to ensure the integrity of distribution systems and provide technical assistance to public water systems.

Pumping Facilities

Vertical turbine well pump

High service pump

- ***Pumps*** should be designed, located and maintained to ***protect water quality and the hydraulics*** of the system and ***guard against interruption*** of service by fire, flood or any other hazard.
- Pumps that are used to transport water through the system are "variable displacement" or "centrifugal" pumps.
  - Variable displacement pumps are used for high volume applications, where an even flow rate is required (such as transporting water through treatment and distribution systems). The discharge rate of these pumps varies with the head (i.e., as the lift or head increases, the pump output decreases). These pumps are not self-priming and, therefore, depend on a positive suction head, or an air-tight seal on the intake side of the pump if the level of water to be pumped is below that of the pump impeller. The most common class of variable displacement pump is the centrifugal pump.
- A pump station should be elevated above the 100-year flood elevation; readily accessible; graded to drain surface runoff away from the station; and protected to prevent vandalism and entry by animals or unauthorized persons.
- At least two pumping units should be provided so that operations can continue if a pump is out of service. The remaining pump or pumps must be capable of providing the maximum pumping demand of the system.
- The pump control system should be equipped with failure alarm systems. In the event that the pump fails to start, or stops for any reason other than normal shut-down on the automatic cycle, an alarm should activate that notifies the operator that the system has failed.

- The purpose of ***storage*** is to assure that safe water is always available for both normal and emergency situations. Adequate storage capacity is important because it ensures the ***positive water pressure*** necessary to ***prevent contaminants from being drawn into the system***. Pressurized water systems are less easily contaminated. If a hole is poked in, water spurts out; thus, contaminants cannot get it.
- Finished water storage often begins at the treatment facility in a "clearwell." Clearwells are often in-ground tanks that provide a reservoir of finished water from which water is pumped to storage and distribution.
- Outside the distribution system, ***storage tanks are normally elevated*** on steel legs or built on a hill above the customers in order to provide water pressure (gravity storage). These tanks usually have a single pipe from the distribution system. Thus, they "ride on the line" and water can go into the tank or come out of the tank through the same line depending on where the system demand is.
- Water supplies must be able to provide safe water at all times at adequate volumes with sufficient pressure. Low pressure, inadequate volumes, and contaminated water from storage facilities are a result of poor design, construction, operation or maintenance. The materials and designs used for finished water storage must provide stability and durability as well as protect the quality of the stored water.
- Demand for water in a distribution system changes significantly throughout each day. As the demands for water vary, a properly finished water storage facility acts as a reserve, or buffer, which prevents sudden changes in water pressure from the system.

Finished Water Storage

- Pressurizes the distribution system which keeps contaminants out
- Allows system to meet peak demands
- Protects pumps

Pressurized (hydropneumatic) tanks

- All finished water storage structures should have watertight roofs that keep out birds, animals, insects and excessive dust. Fencing, locks on access manholes, and other precautions should be provided to prevent trespassing, vandalism and sabotage.
  - Tanks must provide access to the interior for cleaning and maintenance. Manholes should be elevated above the top and fitted with a solid, locked, watertight cover that overlaps the framed opening.
- All water storage structures should have an overflow which is brought down to an elevation close to the ground surface and discharges over a drainage inlet structure or splash plate. No drain or overflow pipe should be connected to a sewer or storm drain in order to avoid potential contamination.
- Storage tanks have to be vented to allow air to come out when water is being pumped into the tanks, and to allow air in when water is leaving the tank. Atmospheric pressures have been know to collapse steel tanks when vents have become blocked.
- Very small systems often use pressurized tanks known as “hydropneumatic tanks” to provide pressure and limit the cycling frequency of pumps. Hydropneumatic tanks are considered acceptable only in systems serving less than 150 households. Pressure tanks should be located above normal ground surface and completely housed. The tanks are charged with air at a pre-determined level. Water is pumped into the tanks, compressing the air and increasing the pressure in the system. At another pre-determined pressure the pumps turn off and the system is provided water from the pressurized tanks. When enough water has been used to allow the pressure to fall to a lower level, the pumps are turned back on.

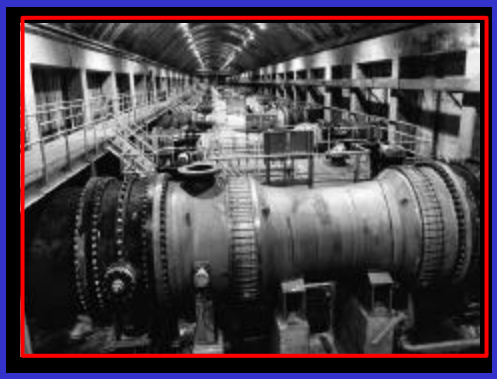
Distribution Systems

Workers welding water main

NYC water main

- For most water systems, the ***distribution and transmission*** of water requires a larger ***capital investment*** and more operating resources than other components of the water system.
  - ***Transmission pipes*** bring water from the source to treatment or ***from treatment to the distribution systems***.
  - ***Distribution pipes deliver water to the customer***. These pipes are also known as "water mains." Many water systems also include booster pumps, which help keep the system pressurized. Structurally sound mains and pumping facilities are critical to guard against public health risks. If pressure is lost or if negative pressure is induced, contaminated water or sewage can be pulled back into the system through leaks. In addition, mains must be in good condition because failure could leave a community without water until the outage is repaired.
- ***Distribution systems*** also include ***appurtenances*** that help safeguard public health.
  - ***Hydrants***, aside from fighting fires, are used to flush stagnant water from the system.
  - ***Water meters*** help prevent overuse of water and provide the system with data on unaccounted water use, which may help the system identify leaks.
  - ***Valves*** are necessary to direct the flow of water or close off a water line for maintenance or repairs. ***Backflow prevention devices*** help ensure that contaminated water that may originate at commercial establishments, residences, or interconnected distribution networks does not contaminate the water system.

Distribution Systems



Valve room

- ***Design and construction standards*** for distribution systems are aimed at avoiding contamination and continuing positive pressure. The components of the distribution system should be selected to meet current industry standards. The corrosive effects of finished water on metal pipe used for water service lines should be considered, together with possible toxicological effects on consumers, resulting from dissolution of metals. Only approved plastic pipe should be used, where plastic is acceptable.
- ***Minimum pressure of at least 20 to 30 psi*** must be maintained so that contaminated ground water cannot enter through leaks. Also, a backflow condition could occur due to backpressure. The system must be designed to supply adequate quantities of water under ample pressure and operated to prevent, as far as possible, conditions leading to the occurrence of negative pressure. Steps to prevent negative pressure include minimizing unplanned shutdowns, providing adequate supply capacity, correcting undersized conditions, and properly selecting and locating booster pumps to prevent the occurrence of a negative head in piping subject to suction. Continuity of service and maintenance of adequate pressure throughout a public water supply system are essential to prevent backsiphonage.
- Design standards provide for the ***horizontal separation of water mains from sewers*** and septic tank absorption field trenches in order to keep them from possible sources of contamination. Water mains crossing sewers must maintain minimum vertical distance between the outside of the water main and the outside of the sewer. At crossings, one full length of water pipe should be laid so both joints are as far from the sewer as possible. Special precautions must be taken where minimum distances cannot be maintained.
- Caution should also be exercised when locating water mains at or near sites such as industrial complexes or sewage treatment plants; e.g. ***avoiding on-site waste disposal*** facilities.

Cross-Connections

Backflow

Pressure backflow preventer

- A ***cross-connection*** is an actual or potential physical connection or arrangement between otherwise separate potable water piping systems and any contaminant, that ***allows water to flow between the two systems***. Unless controlled, cross-connections can result in contaminated water replacing potable water at various sites within a water system.
- Plumbing defects can occur in any part of a water system, and cross-connection hazards can occur where outside water pressure can exceed potable water system pressure.
- A cross-connection can be made either as a pipe-to-pipe connection, in which potable water and contaminated water pipes are linked without proper control valves, or as a pipe-to-water connection, in which the outlet from a potable water supply is submerged in contaminated water.
- The two major types of cross-connection hazards are distinguished by their origins.
  - ***Backpressure backflow*** refers to the ***flow of water toward a potable supply*** when the contaminated water's pressure is greater that the potable water's pressure.
  - ***Backsiphonage backflow*** results from ***negative pressure*** (a vacuum) in the distributing pipes of a potable water supply. Contaminated water is sucked up toward the potable supply.
- Maintaining adequate pressure is an important aspect of reducing the threat from cross-connections. Another effective measure is establishing air gaps. Each fixture should have a vertical air gap of twice the diameter of the pipe or fixture between its water outlet and its flow level rim. This will eliminate the physical cross-connection link. Other backflow prevention devices can be installed when an air gap cannot be made.

Security of Storage and Distribution Systems

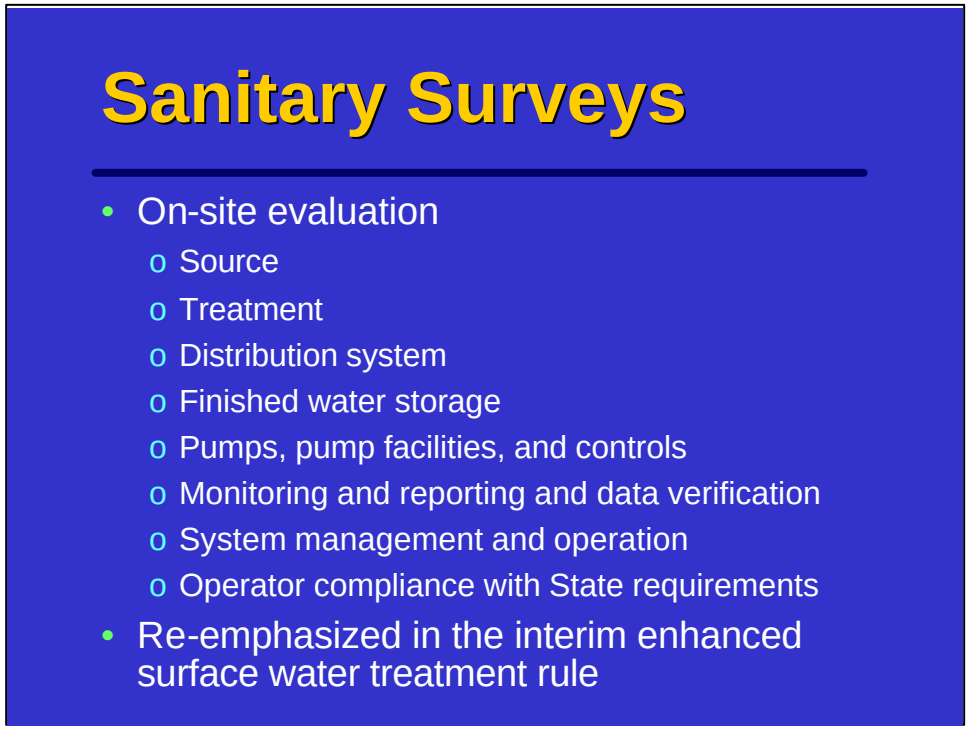
- Secure tank ladders, access hatches and entry points
- Screen vents and overflow pipes
- Isolate storage tank
- Control hydrants and valves
- Monitor and maintain positive pressure
- Implement backflow prevention program

- Water systems are critical infrastructures in every community. Protection of public drinking water systems must be a high priority for local officials in order to ensure an uninterrupted water supply, which is essential for the protection of public health (safe drinking water), and safety (fire fighting).
- Adequate ***security measures*** will help prevent loss of service through terrorist acts, vandalism, or pranks. If a system is prepared, such actions acts may be prevented from occurring. The appropriate level of security is best determined by the water system at the local level. Security measures include:
  - Securing tank ladders, access hatches, and other entry points. Use of high-quality padlocks at entry points will reduce the threat of unauthorized entry. Physical barriers on legs of towers can prevent unauthorized climbing.
  - Screening vents and overflow pipes. Air vents and overflow pipes are direct conduits to finished water. Secure all vents and overflow pipes with heavy-duty screens or grates sufficient to prevent tampering.
  - Isolating the storage tank. A system should be able to take a tank out of operation if there is a contamination problem or structural damage.
  - Hydrants are highly visible and convenient entry points into the distribution system. Use of hydrants for other than fire protection should be regulated. Backflow devices should be required for uses other than fire fighting. Flush hydrants should be kept locked.
  - Monitoring and maintaining positive pressure. This is important to provide fire protection and to prevent backsiphonage that may allow introduction of contaminants into finished water.
  - Implementing a backflow prevention program. Such a program provides an added margin of safety by preventing the intentional introduction of contaminants.

Protecting the Integrity of the Distribution System

- Sanitary surveys
- Operator certification
- Capacity development
- Composite Correction Program
- Comprehensive Performance Evaluation
- Comprehensive Technical Assistance
- Partnership for Safe Water
- Drinking Water Optimization Program

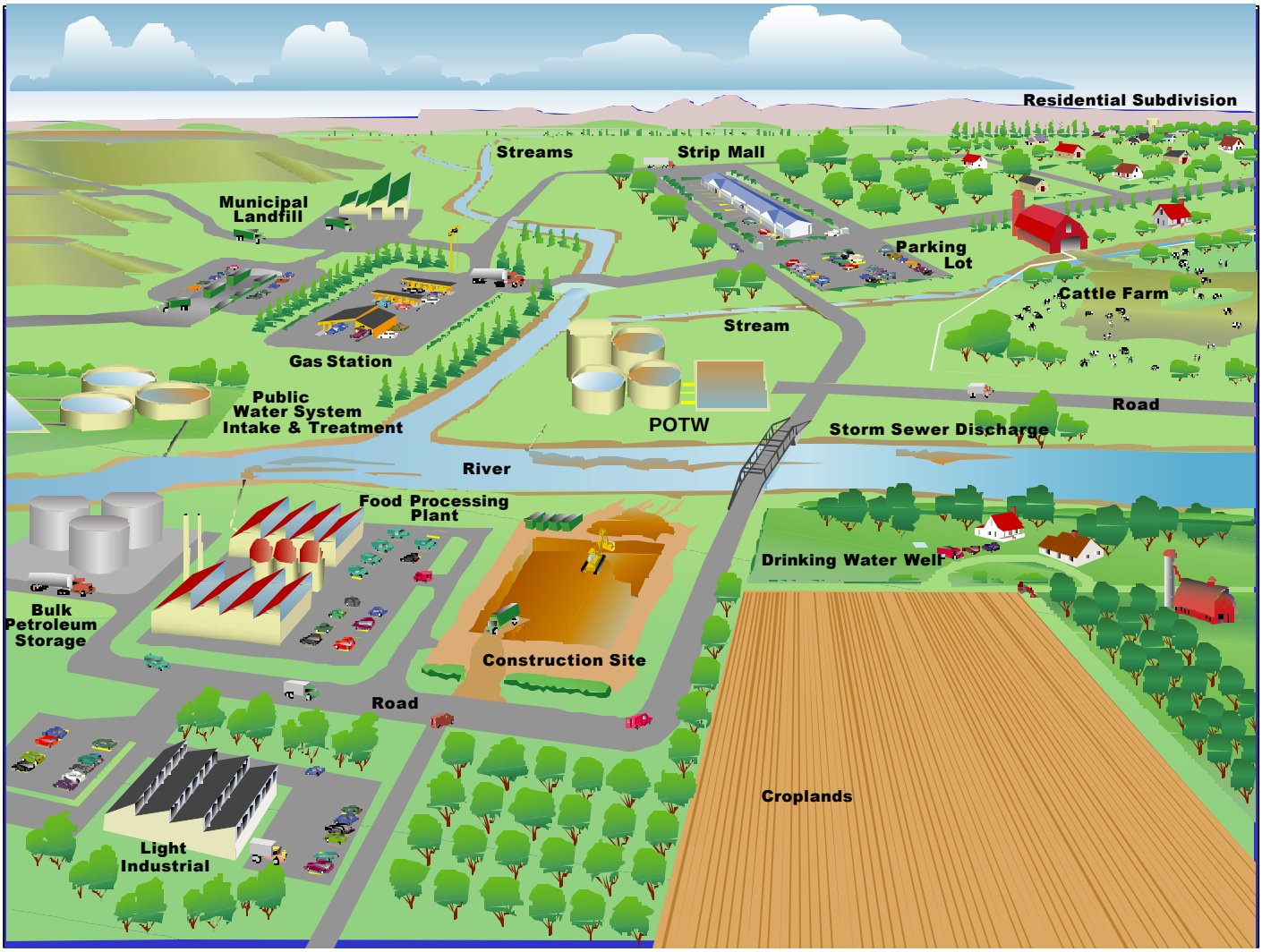
- EPA and the States have a number of other programs to ensure the integrity of drinking water storage and distribution systems. These programs have two goals:
  - To ensure the integrity of the infrastructure; and
  - To ensure that the water system operator and other staff are adequately trained and capable of ensuring the proper operation of the water system.
- The next slides discuss those programs.



- States perform ***sanitary surveys*** to ensure water systems are operating correctly. A sanitary survey is an on-site review of eight specific elements of a public water system, including the water sources, facilities, equipment, and operation and maintenance to evaluate the adequacy of those elements for producing and distributing safe drinking water.
- During a sanitary survey, State engineers check the integrity of a system's infrastructure and review the system's operating practices. The resulting report (sometimes called a sanitary deficiencies report) itemizes actions that a water system should take to ensure safe water.
- Proper operation and maintenance of a water system is important for the prevention of microbial contamination. For this reason, the Interim Enhanced Surface Water Treatment Rule includes a provision requiring States to conduct sanitary surveys at all surface water systems (including GWUDI systems), regardless of size, at specified minimum frequencies. The proposed ground water rule will extend these requirements to ground water systems.

- Ensuring that water systems have ***qualified operators*** is another effort to ensure distribution system integrity and enhance water system operation.
- The 1996 Amendments require States to implement programs to develop operator certification (and re-certification) programs. All States currently have operator certification programs. However, States vary as to how comprehensive their operator certification requirements are. Many States currently exempt small systems from certification requirements. This will change with the requirements in the 1996 SDWA Amendments that required EPA to:
  - Initiate a partnership with States, water systems, and the public to develop information on recommended operator certification requirements;
  - Issue guidelines specifying minimum standards for certification and recertification of the operators of community and nontransient, noncommunity public water systems. The guidelines specify different requirements depending on system size and complexity;
  - Reimburse training and certification costs (through DWSRF set-asides) for operators of systems serving 3,300 people or fewer, including per diem for unsalaried operators, who are required to undergo training as a result of the Federal requirement, through grants to the States; and
  - Publish final EPA guidelines in the *Federal Register* by February 6, 1999. (EPA published the guidelines on February 5, 1999 [64 *FR* 5916-5921].)
- Each State determines the appropriate experience, education, and training requirements for its systems. In addition, States have responsibility for actually certifying operators.

- Studies conducted by the Public Health Service and by EPA in the 1970s identified significant problems in small water systems' ability to provide safe drinking water. To help small systems meet these challenges, the SDWA of 1974 and the 1986 Amendments built in procedures for variances and exemptions, but funding was not available to make small system assistance a priority.
  - By the late 1980s and early 1990s, it was clear that small systems were having greater difficulty keeping up with the rapidly expanding SDWA-mandated regulations. A few States were implementing "viability" initiatives, which sought to promote small system compliance, and otherwise address small system problems, by ensuring that systems had the necessary underlying technical, managerial, and financial wherewithal.
  - The concept of "viability" became known in the 1996 SDWA as "***capacity development***."
- SDWA Section 1420 mandates that EPA assist States in developing water systems' ***financial, managerial, and technical capacity***.
  - States must have programs established to "ensure that all new community water systems and nontransient, noncommunity water systems commencing operations after October 1, 1999, demonstrate technical, managerial, and financial capacity with respect to each national primary drinking water regulation in effect, or likely to be in effect, on the date of commencement of operations."
  - Under this provision, EPA must withhold 20 percent of the State DWSRF capitalization grant for any State that does not develop the means to prevent the formation of new non-viable water systems and/or those that do not develop a strategy to address existing drinking water systems.
  - In addition, States may not provide DWSRF loan assistance to systems lacking these capabilities or to systems that are in significant noncompliance with any drinking water standard or variance.
- The Act also provides States a positive economic incentive to participate in capacity development — they may use a portion of the DWSRF set-aside funds to develop and implement their capacity development activities.



- Think back to the community that we visited on the first day of this class. Using what you've learned since then, what Fedeal authorities under the Clean Water Act and Safe Drinking Water Act, and what State and local authorities could this community use to address the potential contaminants you identified earlier?